

EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

PUBLICATION NUMBER : 2001257075
PUBLICATION DATE : 21-09-01

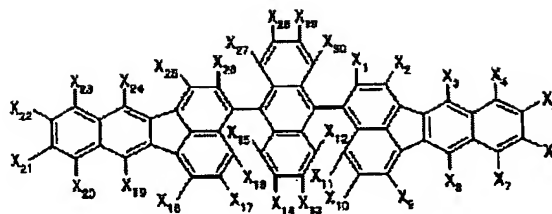
APPLICATION DATE : 10-03-00
APPLICATION NUMBER : 2000066651

APPLICANT : MITSUI CHEMICALS INC;

INVENTOR : NAKATSUKA MASAKATSU;

INT.CL. : H05B 33/14 C07C 13/62 C07C 25/22
C07C 43/21 C09K 11/06 H05B 33/22 //
C07F 5/02

TITLE : HYDROCARBON COMPOUND AND
ELECTROLUMINESCENCE ELEMENT



(1-A)

ABSTRACT : PROBLEM TO BE SOLVED: To provide an organic electroluminescence element that is superior in luminous efficiency and emits in high brightness.

SOLUTION: These are a compound and an electroluminescence element using the compound as expressed in the formula (1-A), wherein X1 to X30 show each independently hydrogen atom, halogen atom, straight chain, branch, or cyclic alkyl group, straight chain, branch or cyclic alkoxy group, or substituted or non-substituted aryl group.

COPYRIGHT: (C)2001,JPO

JAPANESE [JP,2001-257075,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART
EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS
EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

*** NOTICES ***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] Organic electroluminescence devices which come at least to pinch the layer which carries out kind content of 9 and the 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative at least to inter-electrode [of a pair] further.

[Claim 2] Organic electroluminescence devices according to claim 1 whose layer containing 9 and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative is a luminous layer.

[Claim 3] Organic electroluminescence devices according to claim 1 or 2 to which the layer containing 9 and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative is further characterized by containing a luminescent organometallic complex.

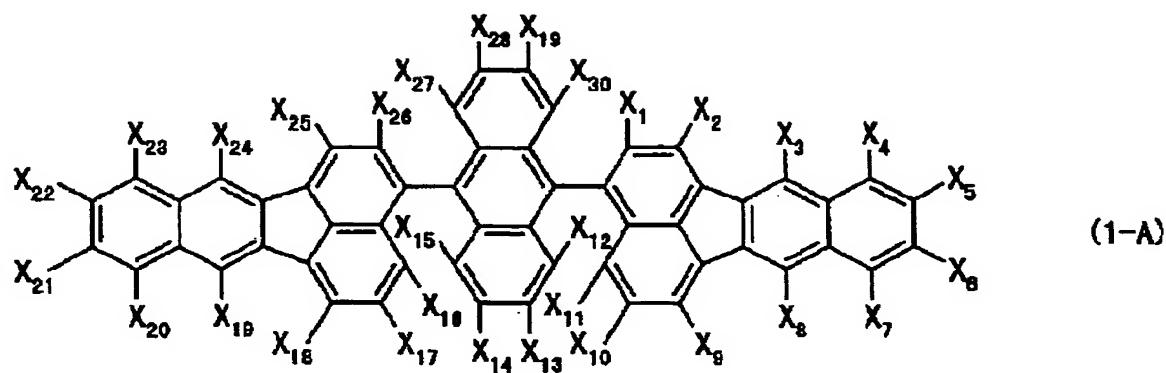
[Claim 4] Organic electroluminescence devices according to claim 1 or 2 to which the layer containing 9 and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative is further characterized by containing a thoria reel amine derivative.

[Claim 5] Organic electroluminescence devices according to claim 1 to 4 which have a hole-injection transportation layer further in inter-electrode [of a pair].

[Claim 6] Organic electroluminescence devices according to claim 1 to 5 which have an electron injection transportation layer further in inter-electrode [of a pair].

[Claim 7] Organic electroluminescence devices according to claim 1 to 6 9 and whose 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative are the compounds expressed with a general formula (1-A) (** 1).

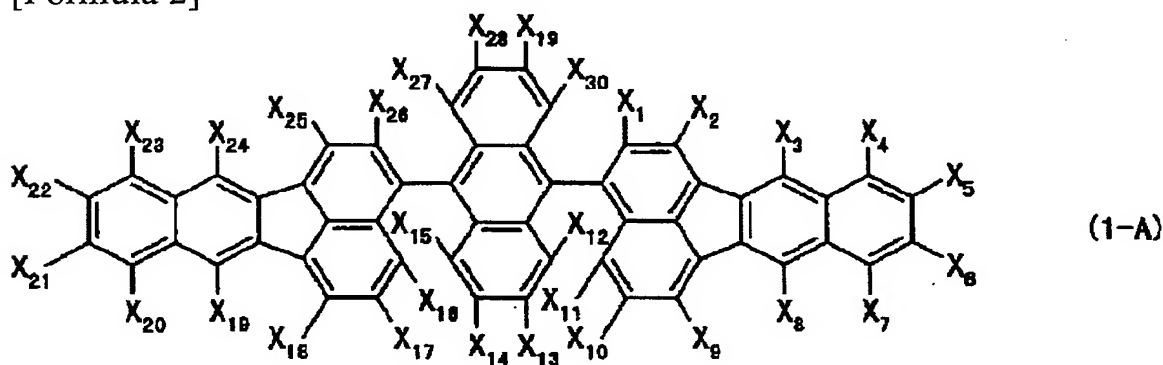
[Formula 1]



(X1 -X30 express independently the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, a permutation, or] among a formula, respectively.)

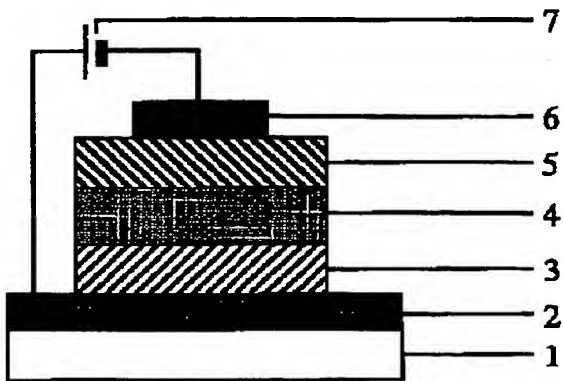

[Claim 8] The hydrocarbon compound expressed with a general formula (1-A) (** 2).

[Formula 2]



(X1 -X30 express independently the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group a permutation, or] among a formula, respectively.)

[Translation done.]

Drawing selection drawing 1 

[Translation done.]

Copyright (C); 2000 Japan Patent Office

JAPANESE

[JP,2001-257075,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART
EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS
EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the new hydrocarbon compound which can be used suitable for organic electroluminescence devices and this light emitting device.

[0002]

[Description of the Prior Art] Conventionally, although inorganic electroluminescence devices have been used as the panel mold light sources, such as a back light, in order to make this light emitting device drive, the high voltage of an alternating current is required for them. [Appl.Phys.Lett., 51, and 913] by which the organic electroluminescence devices (an organic electroluminescent element: organic EL device) which became recently and used the organic material for luminescent material were developed (1987). Organic electroluminescence devices are components which emit light using the light which has the structure pinched between an anode plate and cathode in the thin film containing a fluorescence organic compound, injects an electron and an electron hole (hole) into this thin film, and is emitted in case an exciton (exciton) is made to generate and this exciton deactivates by making it recombine. organic electroluminescence devices -- severalV- dozens -- it is the low battery of about V direct current, and luminescence of various colors (for example, red, blue, green) is possible by being able to emit light and choosing the class of fluorescence organic compound. As for the organic electroluminescence devices which have such a description, the application to various light emitting devices, a display device, etc. is expected. However, generally, luminescence brightness is low and is not enough practically.

[0003] As an approach of raising luminescence brightness, the organic electroluminescence devices which used for example, tris (8-quinolate) aluminum as a luminous layer, and used the host compound, the coumarin derivative, and the pyran derivative as a guest compound (dopant) are proposed [J.Appl.Phys., 65, and 3610] (1989). Moreover, it is benzo[rst] as a luminous

layer. Organic electroluminescence devices using the host compound and the acridone derivative (for example, N-methyl-2-methoxy acridone) as a guest compound are proposed in bis-2-methyl-8-quinolate (4-phenyl phenolate) aluminum (JP,8-67873,A). However, these light emitting devices are also hard to be referred to as having sufficient luminescence brightness. In current, organic electroluminescence devices which emit light in high brightness further are desired.

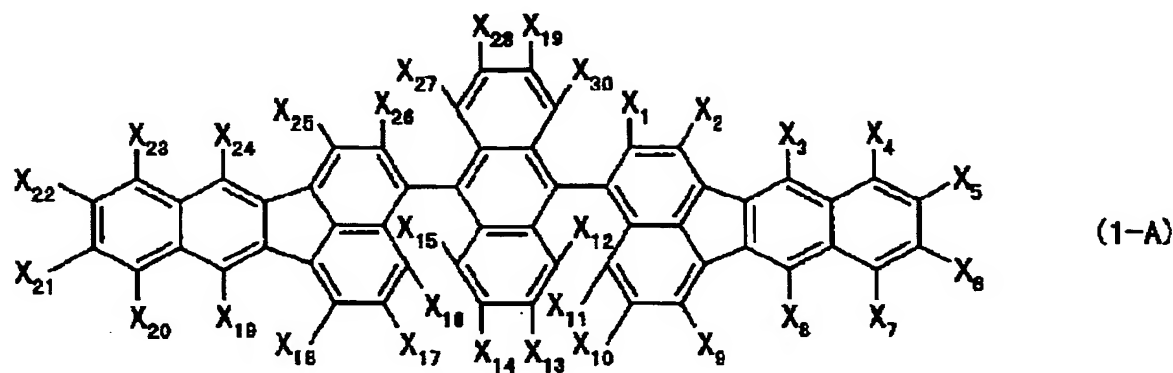
[0004]

[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the organic electroluminescence devices which are excellent in luminous efficiency and emit light in high brightness. Furthermore, it is offering the new hydrocarbon compound which can be used suitable for this light emitting device.

[0005]

[Means for Solving the Problem] this invention person etc. came to complete this invention, as a result of examining organic electroluminescence devices wholeheartedly. This invention namely, the layer which carries out kind content of 9 and the 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative at least to inter-electrode [of ** pair] The layer containing the organic electroluminescence devices which it comes to pinch further at least, **9, and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative The layer containing the organic electroluminescence devices given [aforementioned] in ** which is a luminous layer, **9, and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative Furthermore, the aforementioned ** characterized by containing a luminescent organometallic complex or organic electroluminescence devices given in **, ** The layer containing 9 and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative Furthermore, the aforementioned ** characterized by containing a thoria reel amine derivative or organic electroluminescence devices given in **, ** Organic electroluminescence devices given in either the aforementioned ** which has a hole-injection transportation layer further in inter-electrode [of a pair] - **, ** Organic electroluminescence devices given in either the aforementioned ** which has an electron injection transportation layer further in inter-electrode [of a pair] - **, ** Organic electroluminescence devices given in either the aforementioned ** 9 and whose 10-screw ([Benzok] fluoranthene-3'-IRU) anthracene derivative are the compounds expressed with a general formula (1-A) (** 3) - **, [0006]

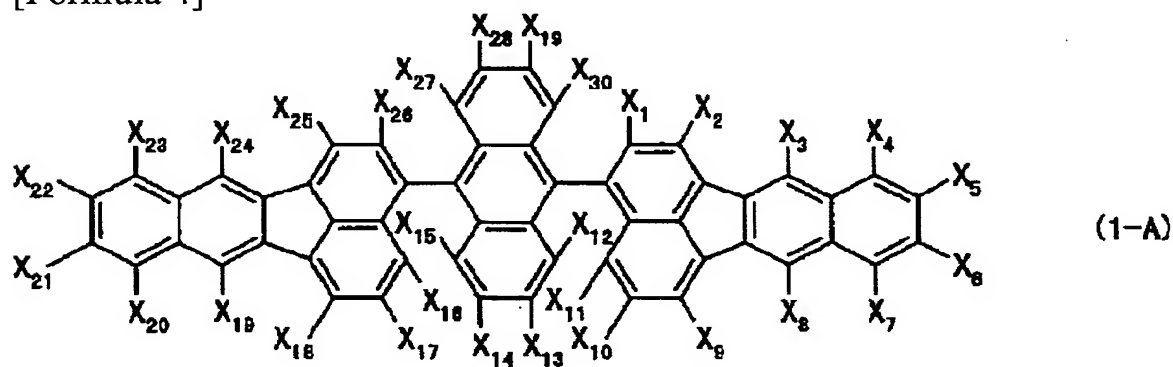
[Formula 3]



(X1 -X30 express independently the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, a permutation, or] among a formula, respectively.) This invention relates to the hydrocarbon compound expressed with ** general formula (1-A) (** 4) further.

[0007]

[Formula 4]



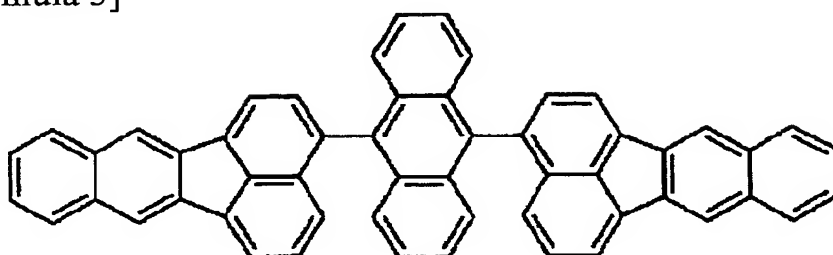
(X1 -X30 express independently the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, a permutation, or] among a formula, respectively.)

[0008]

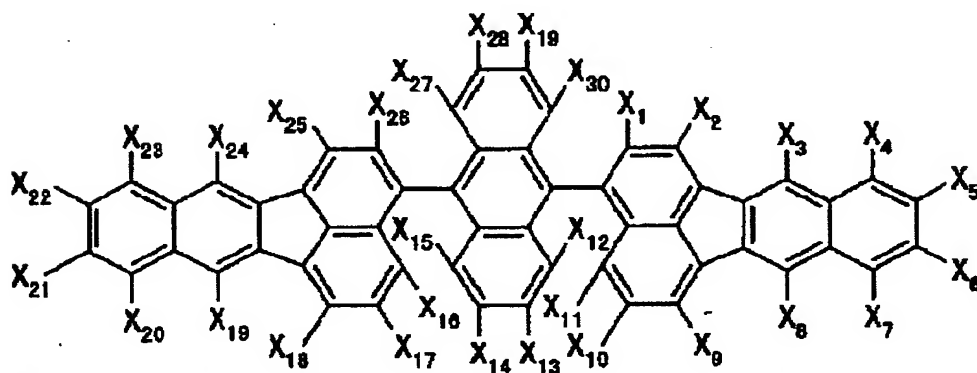
[Embodiment of the Invention] Hereafter, this invention is explained to a detail. The organic electroluminescence devices of this invention come at least to pinch the layer which carries out kind content of 9 and the 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative at least to inter-electrode [of a pair] further. 9 and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative (it is hereafter written as the compound A concerning this invention) concerning this invention express the compound which has the frame expressed with a general formula (1) and (** 5). The compound A which the frame expressed with a general formula (1) may be permuted by various substituents, and starts this invention is a compound expressed with a general formula (1-A) (** 5) preferably.

[0009]

[Formula 5]



(1)



(1-A)

(X1 -X30 express independently the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group a permutation, or] among a formula, respectively.)

[0010] In the compound expressed with a general formula (1-A), X1 -X30 express independently the aryl group which is not permuted [a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, an annular alkoxy group, a permutation, or], respectively. In addition, in this invention, an aryl group expresses heterocycle type aromatic series radicals, such as ring type aromatic series radicals, for example, a furil radical, such as a phenyl group and a naphthyl group, a thienyl group, and a pyridyl radical. In the compound expressed with a general formula (1-A), X1 -X30 express preferably the aryl group which is not permuted [the permutation of a hydrogen atom, a halogen atom, the straight chain of carbon numbers 1-20, branching or an annular alkyl group, the straight chain of carbon numbers 1-20, branching, an annular alkoxy group, or carbon numbers 4-20, or].

[0011] As an example of X1 -X30 in a general formula (1-A) For example, halogen atoms, such as hydrogen atom;, for example, a fluorine atom, a chlorine atom, and a bromine atom; for example A methyl group, an ethyl group, n-propyl group, an isopropyl group, n-butyl, An isobutyl radical, sec-butyl, tert-butyl, n-pentyl radical, An isopentyl radical, a neopentyl radical, a tert-pentyl radical, n-hexyl group, 1-methyl pentyl radical, 4-methyl-2-pentyl radical, 3, and 3-dimethyl butyl, 2-ethyl butyl, n-heptyl radical, 1-methyl hexyl group, a cyclohexyl methyl group, n-octyl radical, a tert-octyl radical, 1-methyl

heptyl radical, a 2-ethylhexyl radical, 2-propyl pentyl radical, n-nonyl radical, 2, and 2-dimethyl heptyl radical, 2, a 6-dimethyl-4-heptyl radical, 3 and 5, 5-trimethylhexyl radical, n-decyl group, n-undecyl radical, 1-methyl decyl group, n-dodecyl, n-tridecyl radical, 1-hexyl heptyl radical, n-tetradecyl radical, An n-pentadecyl group, n-hexadecyl radical, an n-heptadecyl radical, n-octadecyl radical, Straight chains, such as n-ray KOSHIRU radical, a cyclopentyl group, a cyclohexyl radical, 4-methylcyclohexyl radical, a 4-tert-butyl cyclohexyl radical, a cycloheptyl radical, and a cyclo octyl radical, branching, or annular alkyl group;

[0012] For example, a methoxy group, an ethoxy radical, n-propoxy group, an isopropoxy group, An n-butoxy radical, an iso butoxy radical, a sec-butoxy radical, an n-pentyloxy radical, A neopentyl oxy-radical, a cyclopenthyloxy radical, an n-hexyloxy radical, 3 and 3-dimethyl butyloxy radical, 2-ethyl butyloxy radical, a cyclohexyloxy radical, n-heptyloxy radical, n-octyloxy radical, 2-ethylhexyloxy radical, n-nonyloxy radical, an n-decyloxy radical, n-undecyloxy radical, Straight chains, such as n-dodecyloxy radical, n-tridecyl oxy-radical, n-tetradecyl oxy-radical, an n-pentadecyl oxy-radical, n-hexadecyl oxy-radical, an n-heptadecyl oxy-radical, n-octadecyloxy radical, and n-EIKO sill oxy-radical, branching, or annular alkoxy group;

[0013] For example, a phenyl group, 2-methylphenyl radical, 3-methylphenyl radical, 4-methylphenyl radical, 4-ethyl phenyl group, a 4-n-propyl phenyl group, 4-isopropyl phenyl group, a 4-n-buthylphenyl radical, 4-isobutyl phenyl group, A 4-tert-buthylphenyl radical, 4-isopentyl phenyl group, a 4-tert-pentyl phenyl group, A 4-n-hexyl phenyl group, 4-cyclohexyl phenyl group, a 4-n-heptyl phenyl group, A 4-n-octyl phenyl group, a 4-n-nonylphenyl radical, a 4-n-DESHIRU phenyl group, A 4-n-undecyl phenyl group, a 4-n-dodecyl phenyl group, a 4-n-tetradecyl phenyl group, 2, 3-dimethylphenyl radical, 2, 4-dimethylphenyl radical, 2, 5-dimethylphenyl radical, 2, 6-dimethylphenyl radical, 3, 4-dimethylphenyl radical, 3, 5-dimethylphenyl radical, 3, 4, 5-trimethyl phenyl radical, 2, 3 and 5, a 6-tetramethyl phenyl group, 5-indanyl radical, 1, 2 and 3, a 4-tetrahydro-5-naphthyl group, 1, 2, 3, a 4-tetrahydro-6-naphthyl group, 2-methoxyphenyl radical, 3-methoxyphenyl radical, 4-methoxyphenyl radical, a 3-ethoxy phenyl group, A 4-ethoxy phenyl group, a 4-n-propoxy phenyl group, 4-isopropoxy phenyl group, A 4-n-butoxy phenyl group, a 4-iso butoxy phenyl group, a 4-n-pentyloxy phenyl group, A 4-n-hexyloxy phenyl group, 4-cyclohexyloxy phenyl group, A 4-n-heptyloxy phenyl group, a 4-n-octyloxy phenyl group, A 4-n-nonyloxy phenyl group, a 4-n-decyloxy phenyl group, a 4-n-undecyloxy phenyl group, a 4-n-dodecyloxy phenyl group, a 4-n-tetradecyl oxy-phenyl group, [0014] 2, 3-dimethoxy phenyl group, 2, 4-dimethoxy phenyl group, 2, 5-dimethoxy phenyl group, 3, 4-dimethoxy phenyl group, 3, 5-dimethoxy phenyl group, 3, 5-diethoxy phenyl group, A 2-methoxy-4-methylphenyl radical, a 2-methoxy-5-methylphenyl radical, A 2-methyl-4-methoxyphenyl radical, a 3-methyl-4-methoxyphenyl

radical, A 3-methyl-5-methoxyphenyl radical, 2-fluoro phenyl group, 3-fluoro phenyl group, 4-fluoro phenyl group, 2-chlorophenyl radical, a 3-chlorophenyl radical, 4-chlorophenyl radical, 4-BUROMO phenyl group, 4-trifluoro methylphenyl radical, 2, a 4-difluoro phenyl group, 2, 4-dichlorophenyl radical, 3, 4-dichlorophenyl radical, 3, 5-dichlorophenyl radical, a 2-methyl-4-chlorophenyl radical, A 2-chloro-4-methylphenyl radical, a 3-chloro-4-methylphenyl radical, A 2-chloro-4-methoxyphenyl radical, a 3-methoxy-4-fluoro phenyl group, A 3-methoxy-4-chlorophenyl radical, a 3-fluoro-4-methoxyphenyl radical, 4-phenyl phenyl group, 3-phenyl phenyl group, 4-(4'-methylphenyl) phenyl group, 4-(4'-methoxyphenyl) phenyl group, 1-naphthyl group, 2-naphthyl group, A 4-methyl-1-naphthyl group, a 4-ethoxy-1-naphthyl group, a 6-n-butyl-2-naphthyl group, The aryl group which is not permuted [permutations, such as a 6-methoxy-2-naphthyl group, a 7-ethoxy-2-naphthyl group, 2-furil radical, 2-thienyl group, 3-thienyl group, 2-pyridyl radical, 3-pyridyl radical, and 4-pyridyl radical, or] can be mentioned.

[0015] More preferably, it is a hydrogen atom, a fluorine atom, a chlorine atom, the alkyl group of carbon numbers 1-10, the alkoxy-group of carbon numbers 1-10, or the aryl group of carbon numbers 6-12, and they are a hydrogen atom, a fluorine atom, a chlorine atom, the alkyl group of carbon numbers 1-6, the alkoxy group of carbon numbers 1-6, or the aryl group of carbon numbers 6-10 still more preferably.

[0016] It is the description to carry out kind use of 9 and the 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative at least in the organic electroluminescence devices of this invention. For example, if they are used for a luminous layer, using 9 and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative as a luminescence component, it will become possible to offer the organic electroluminescence devices which are not in the former and which emit light to the bluish green color - yellowish green which were excellent in endurance with high brightness. Moreover, if a luminous layer is formed combining other luminescence components, it will become possible to also offer the organic electroluminescence devices which emit light in the white which was excellent in endurance with high brightness.

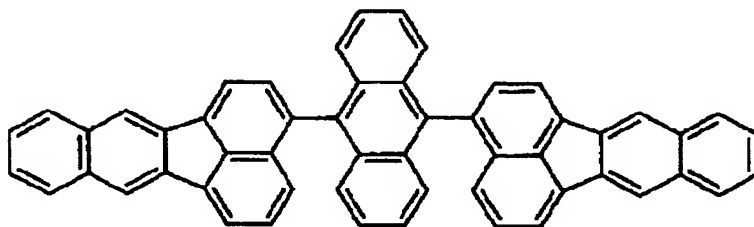
[0017] As an example of the compound A concerning this invention, although the following compounds (** 6 --izing 34) can be mentioned, this invention is not limited to these, for example.

[0018]

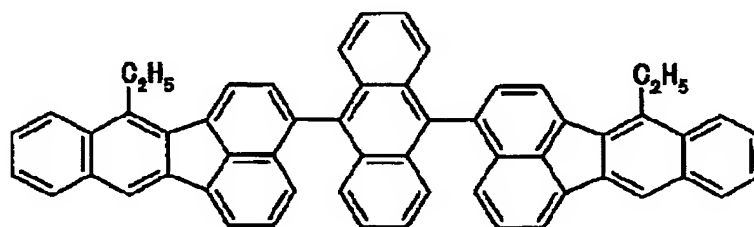
[Formula 6]

例示化合物番号

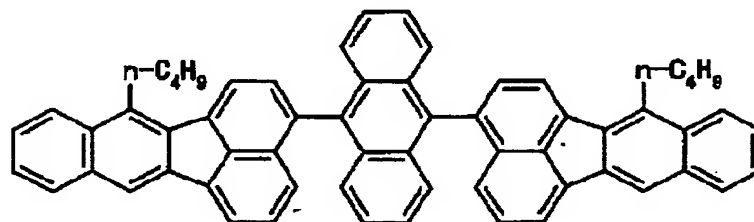
A-1



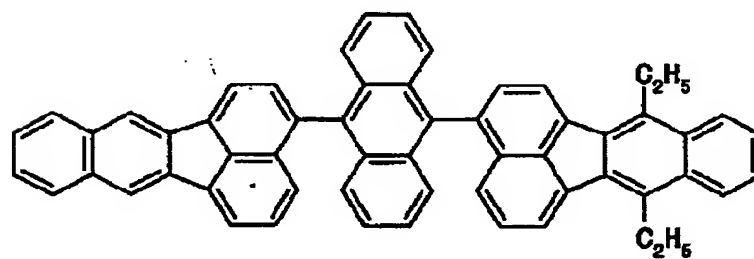
A-2



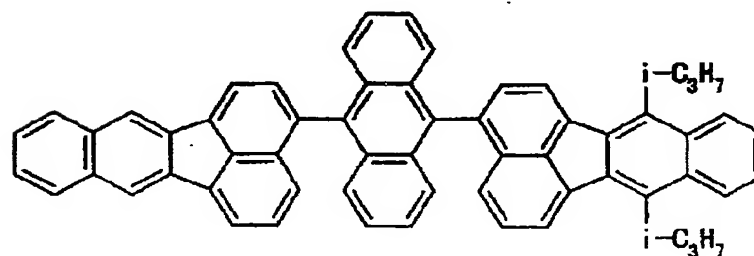
A-3



A-4

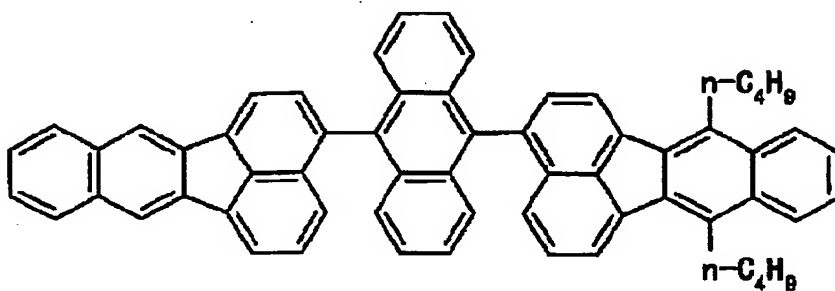


A-5

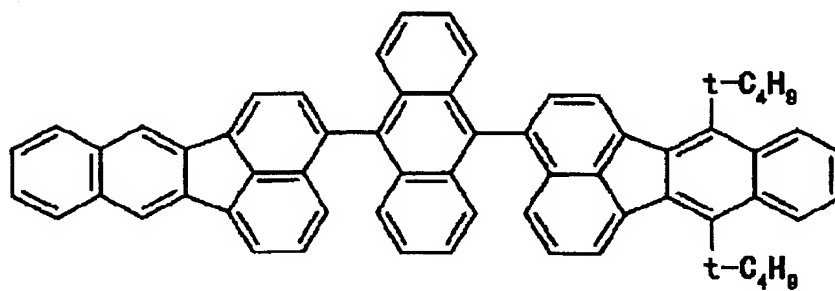


[Formula 7]

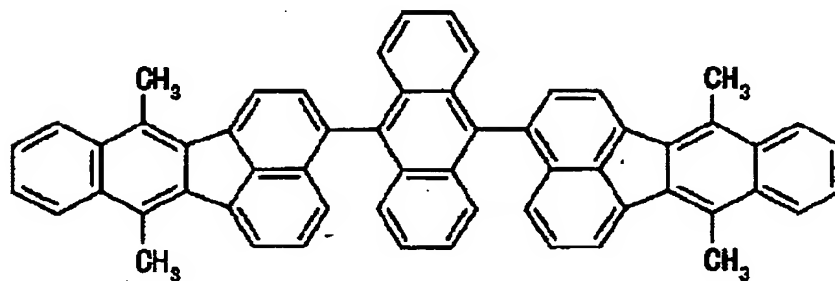
A-6



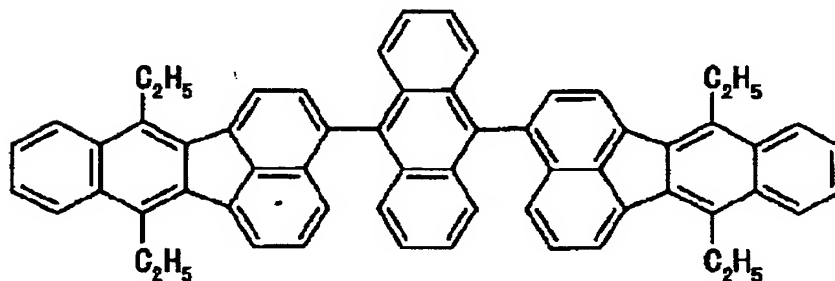
A-7



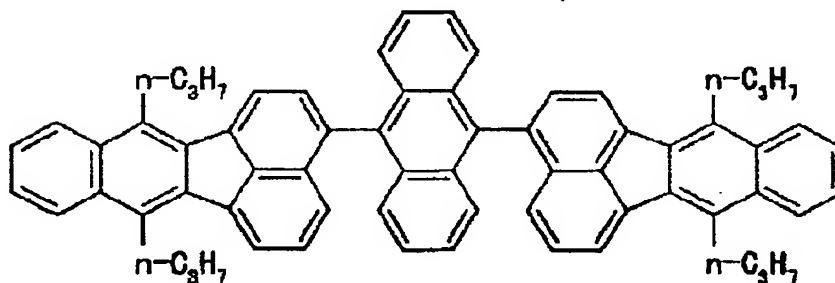
A-8



A-9



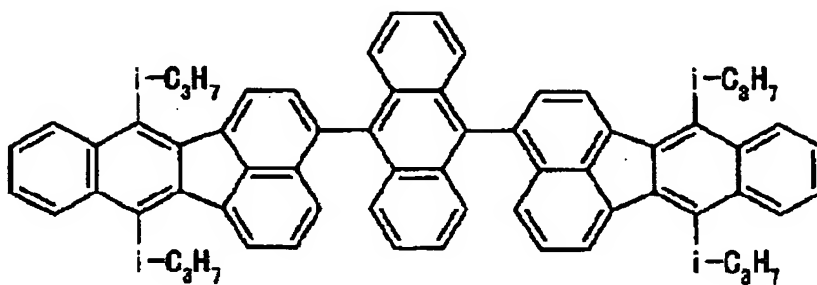
A-10



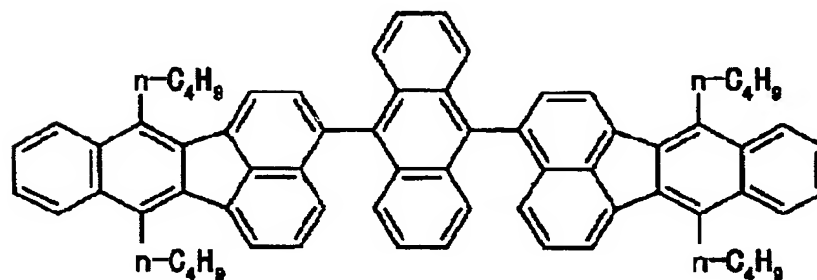
[0020]

[Formula 8]

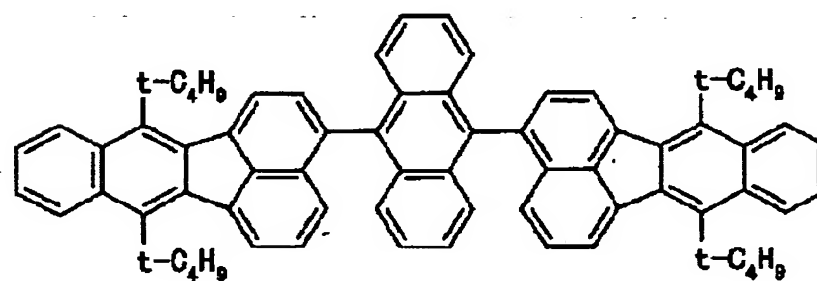
A-11



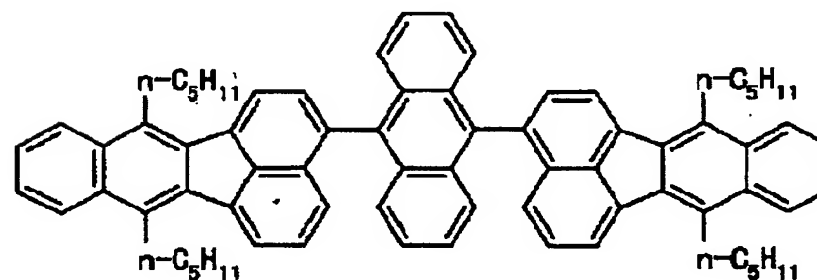
A-12



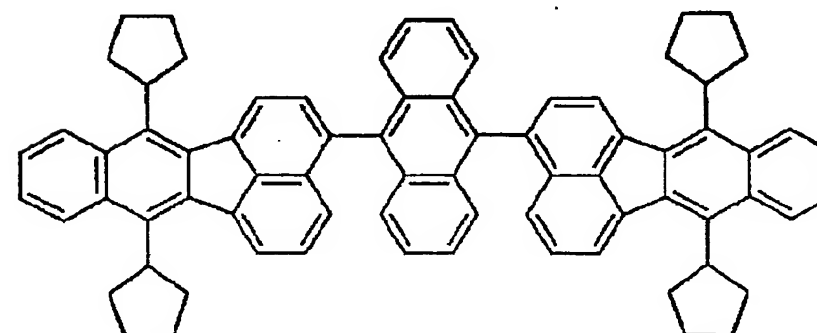
A-13



A-14



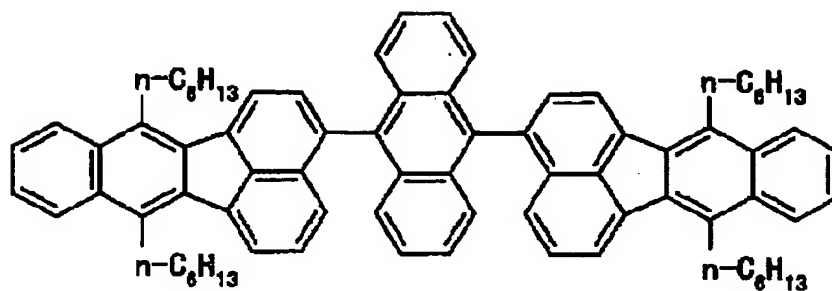
A-15



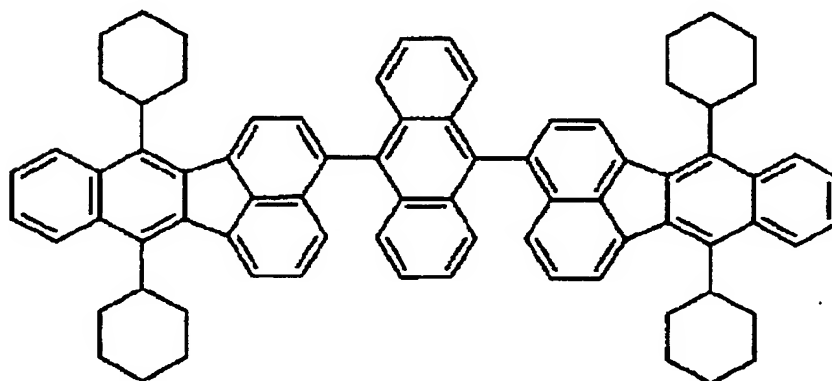
[0021]

[Formula 9]

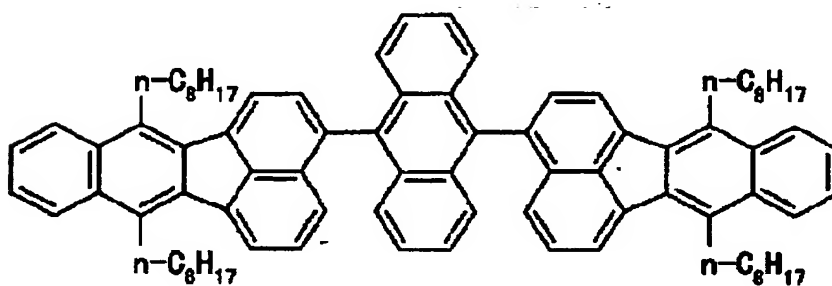
A-16



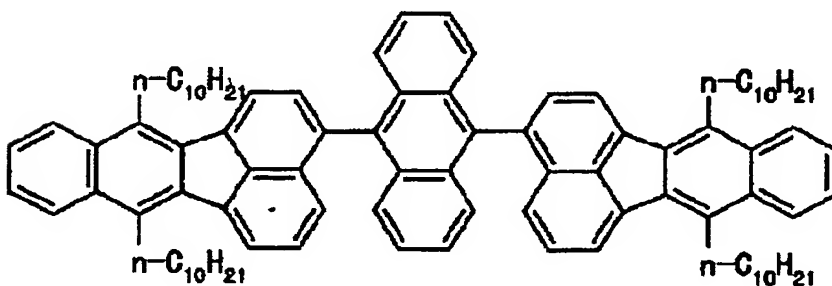
A-17



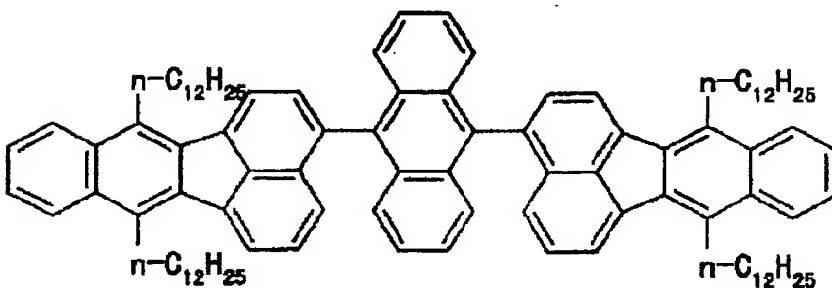
A-18



A-19



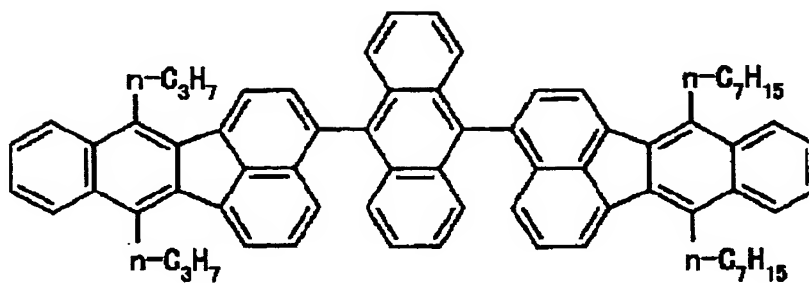
A-20



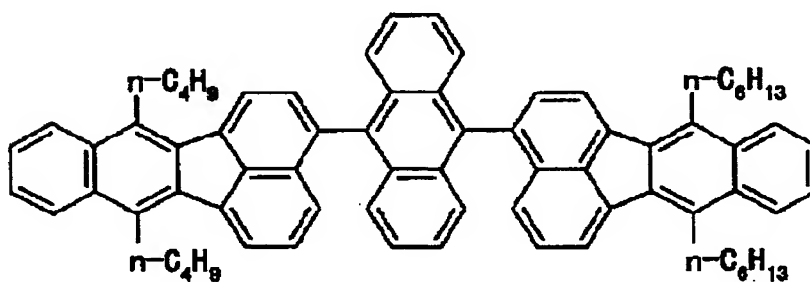
[0022]

[Formula 10]

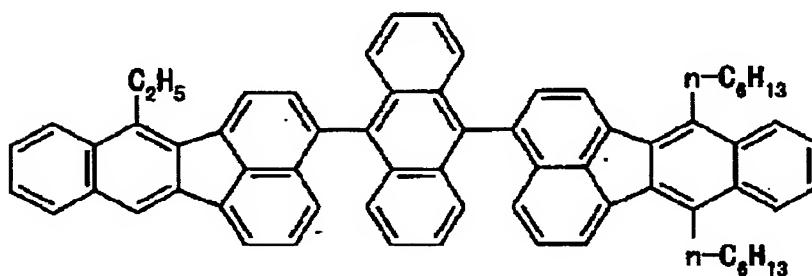
A-21



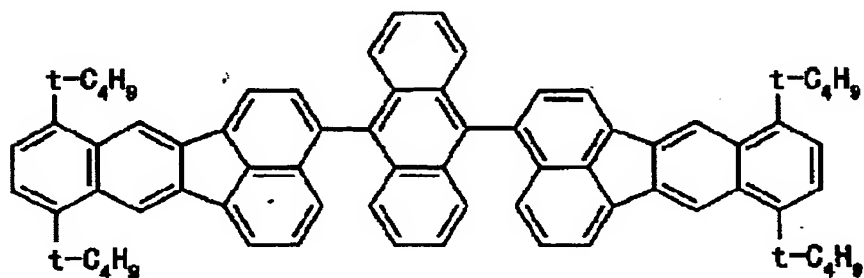
A-22



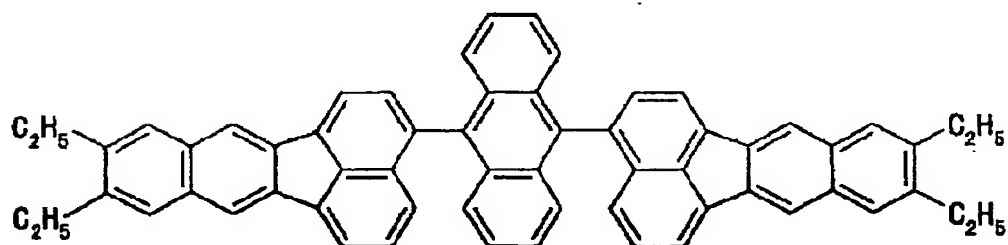
A-23



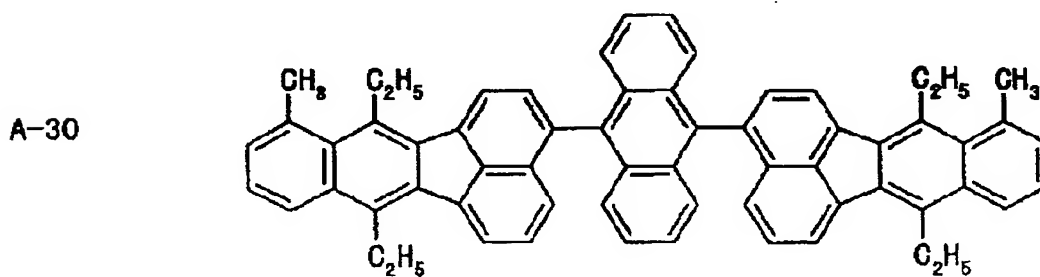
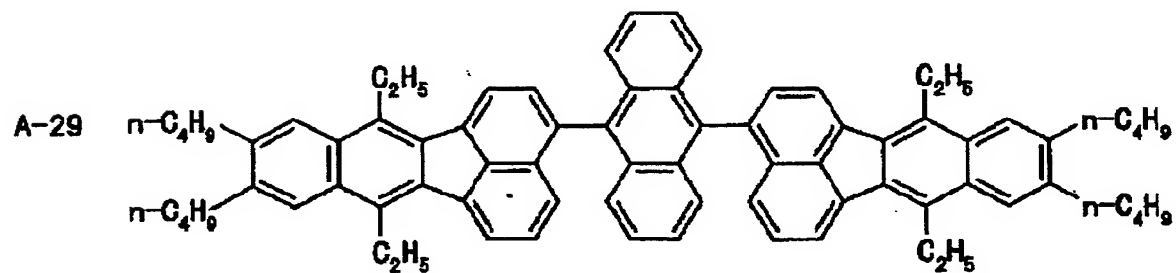
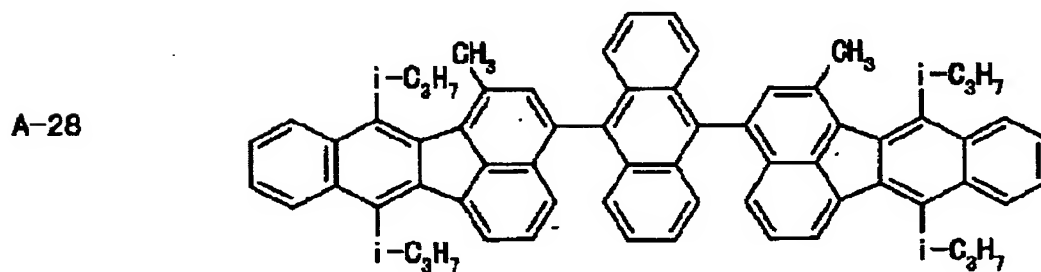
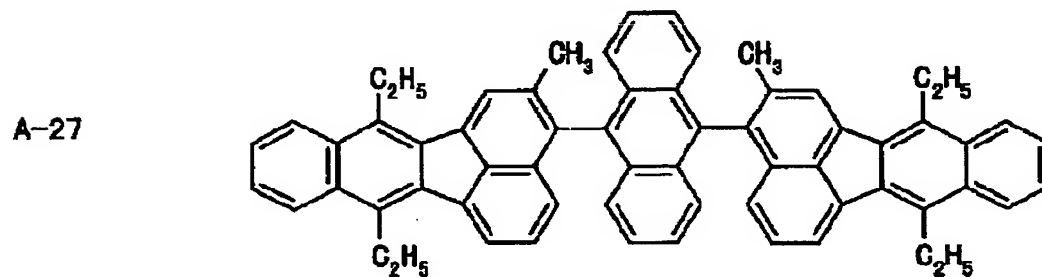
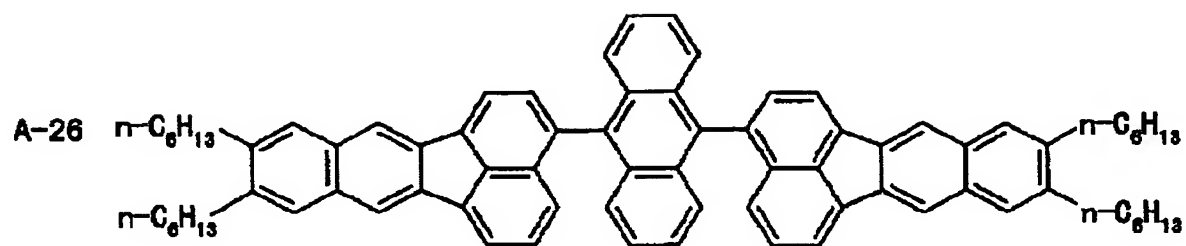
A-24



A-25

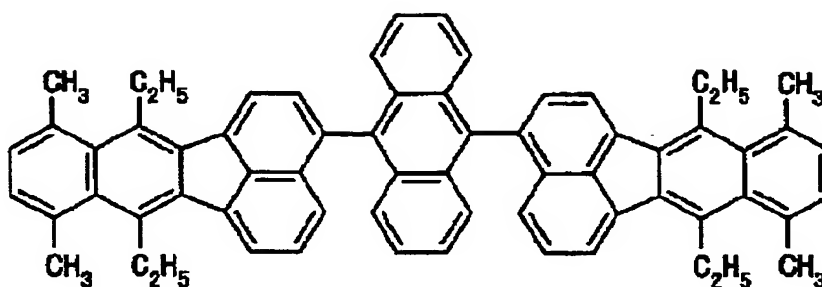


[0023]
[Formula 11]

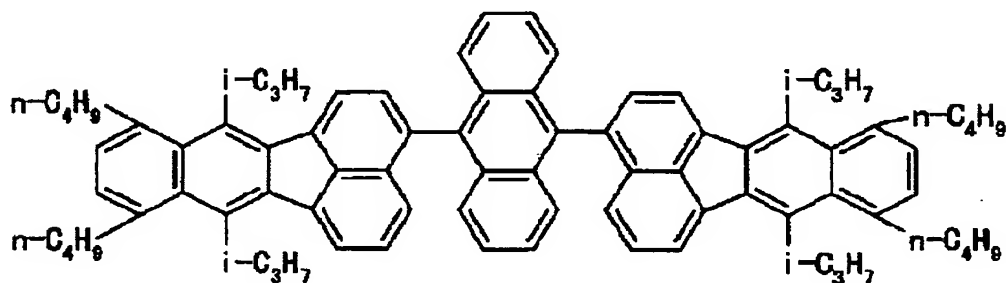


[Formula 12]

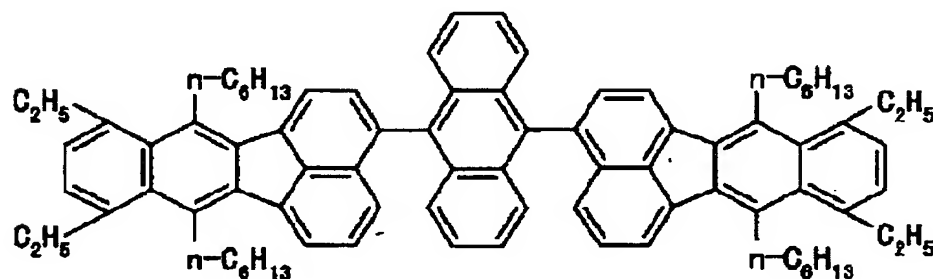
A-31



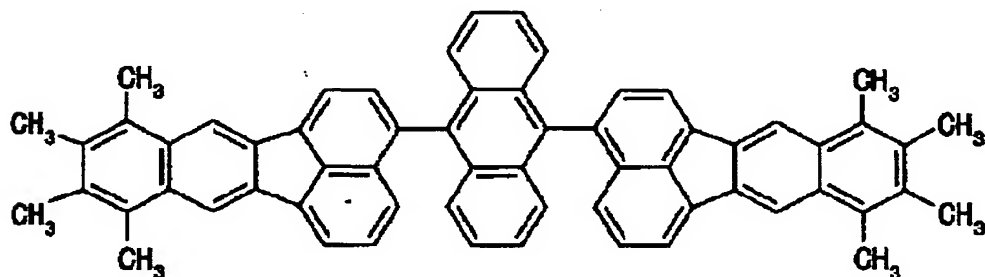
A-32



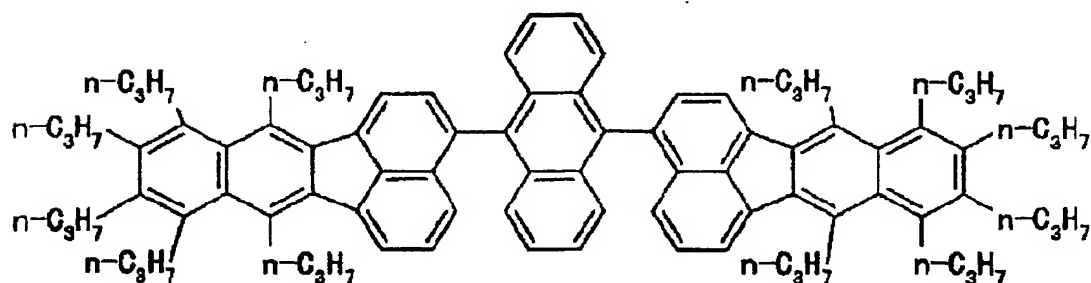
A-33



A-34



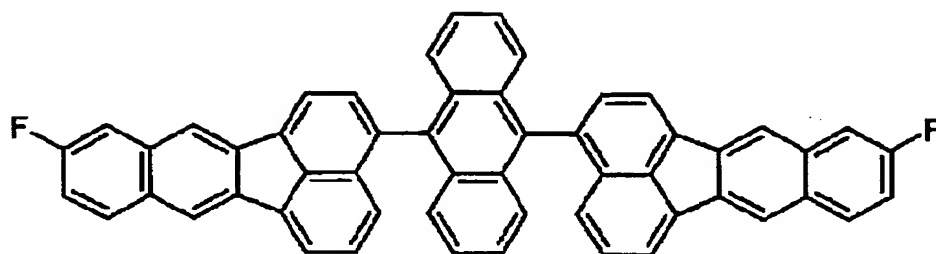
A-35



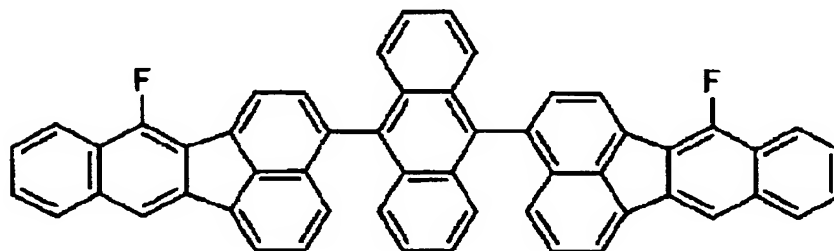
[0025]

[Formula 13]

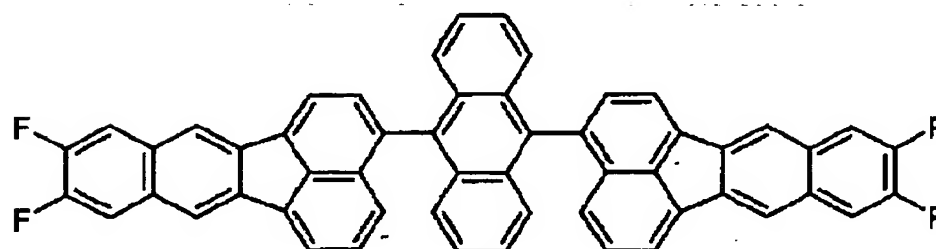
B-1



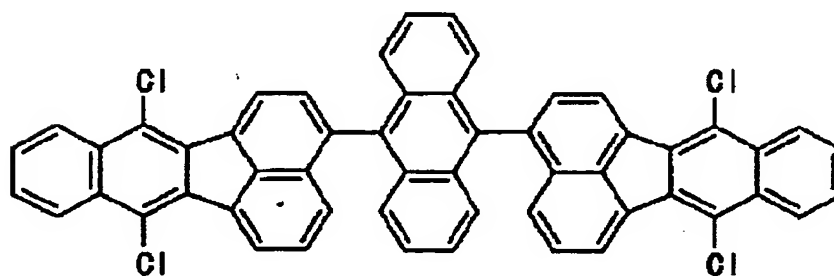
B-2



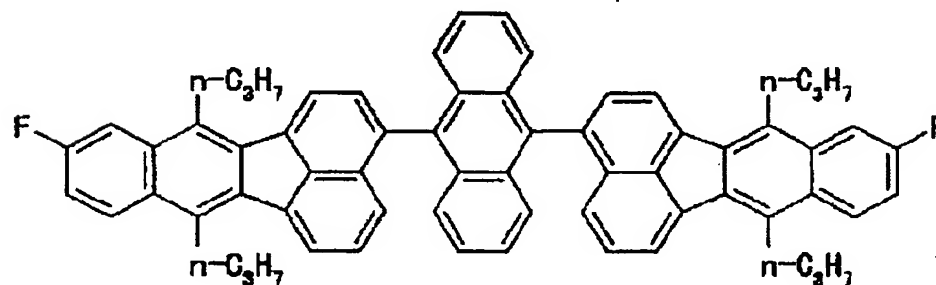
B-3



B-4

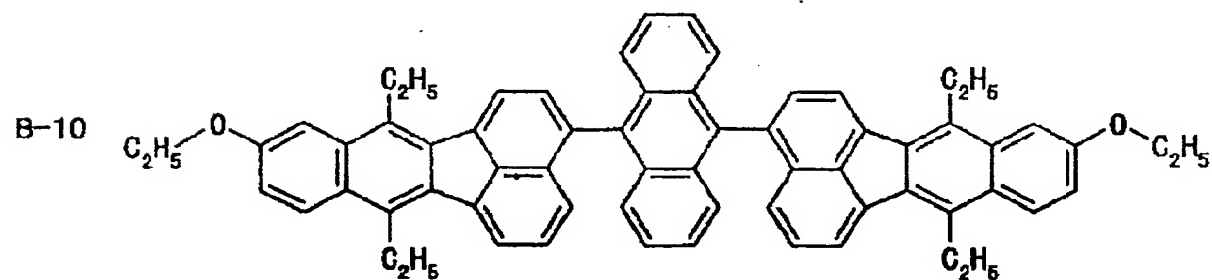
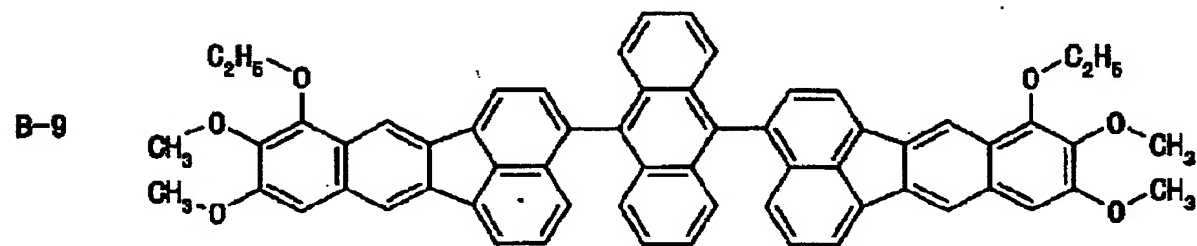
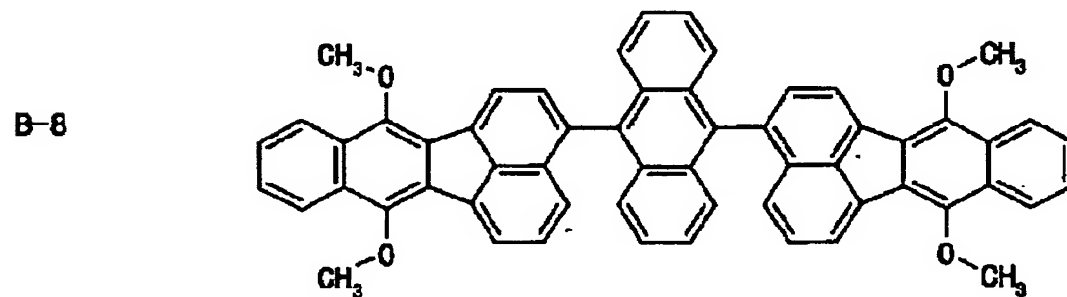
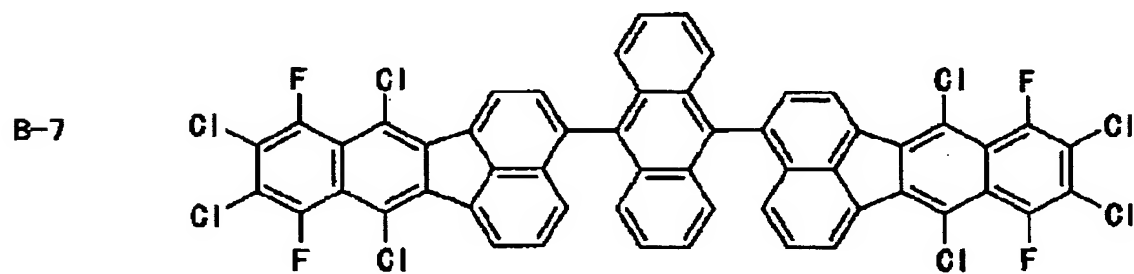
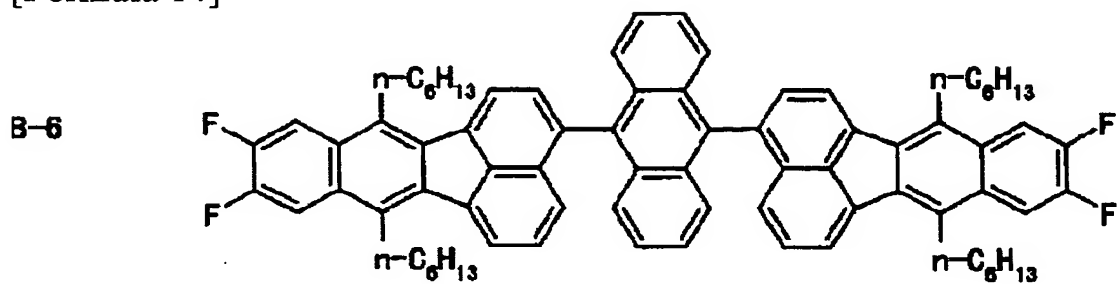


B-5



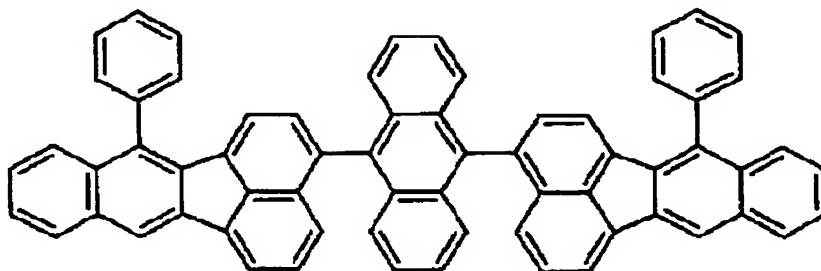
[0026]

[Formula 14]

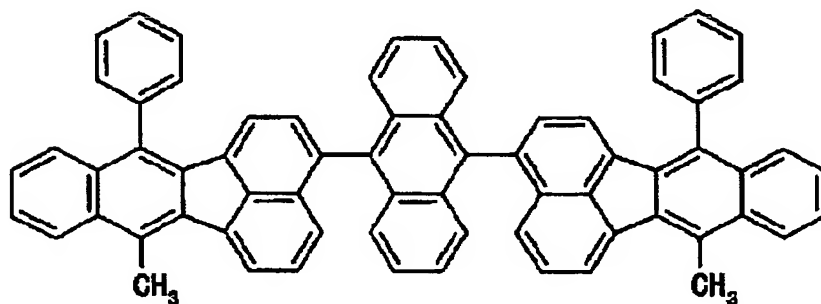


[0027]
[Formula 15]

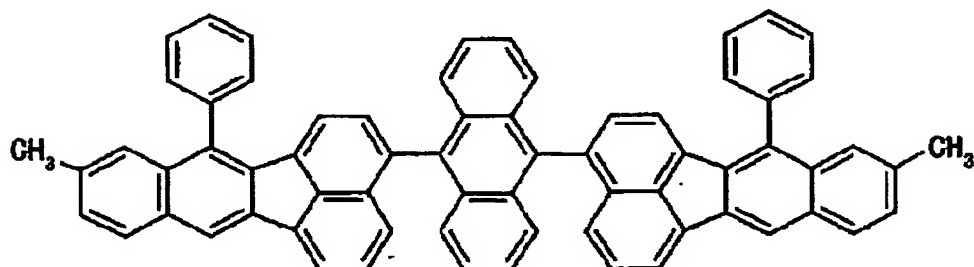
C-1



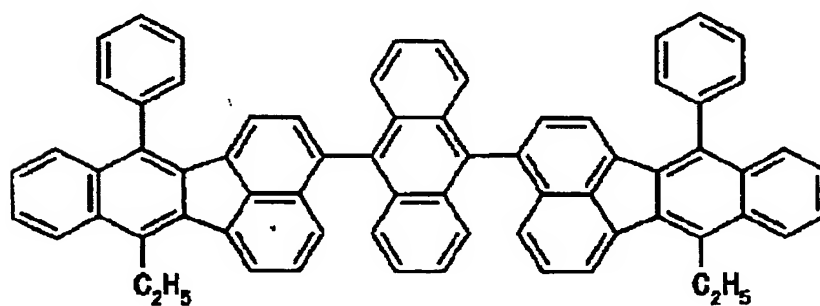
C-2



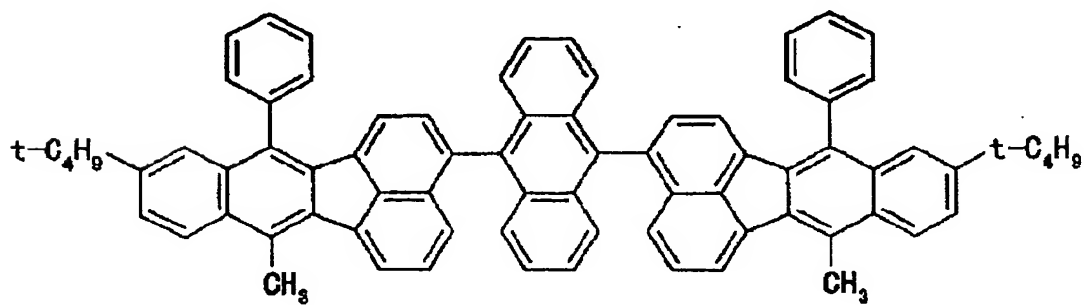
C-3



C-4



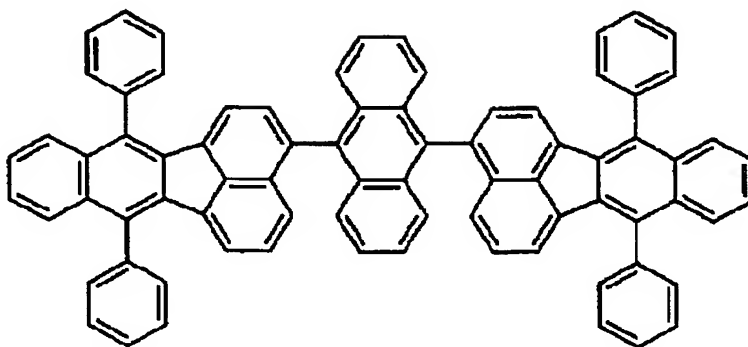
C-5



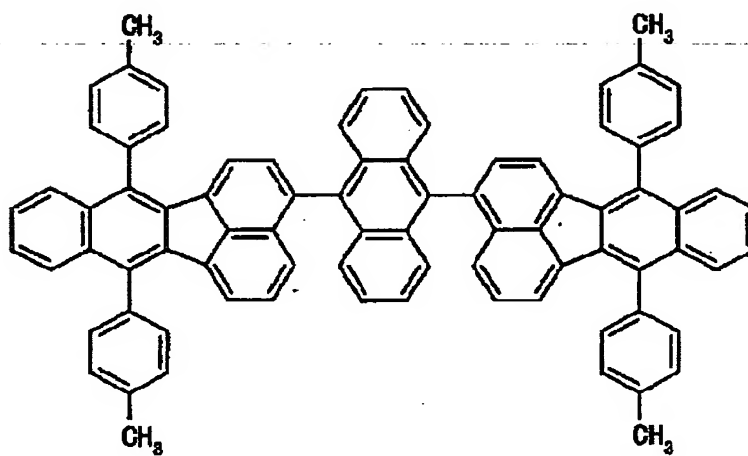
[0028]

[Formula 16]

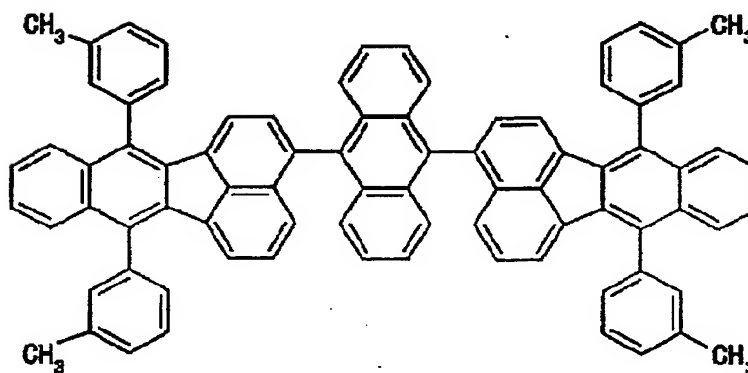
C-6



C-7



C-8

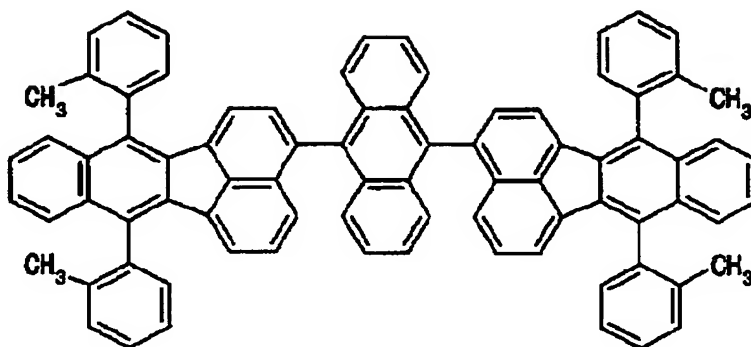


[0029]

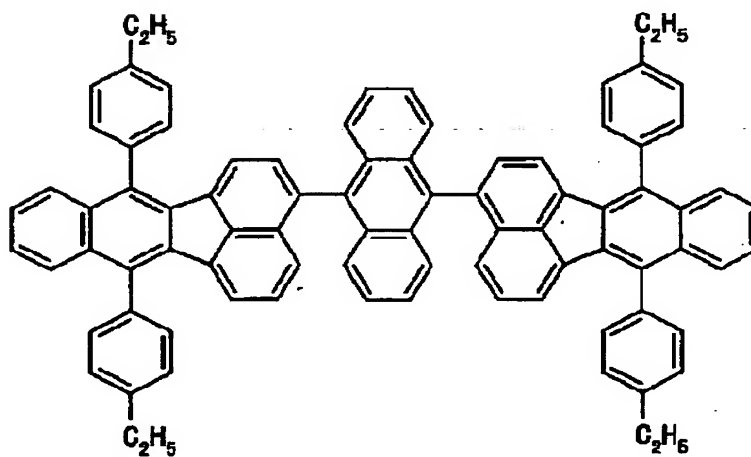
[Formula 17]

80

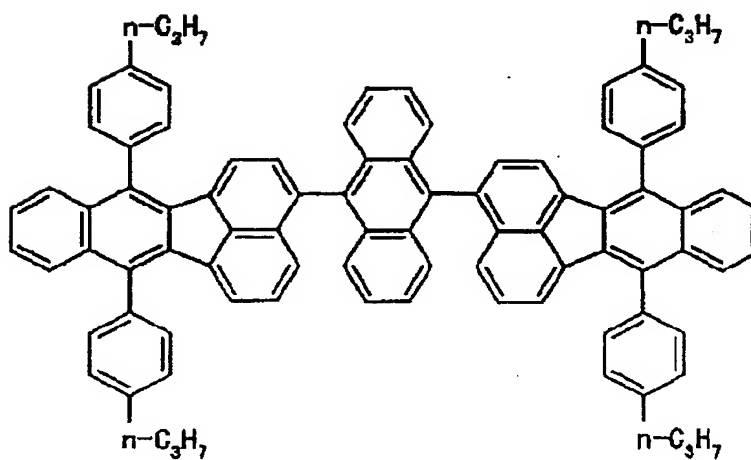
C-9



C-10



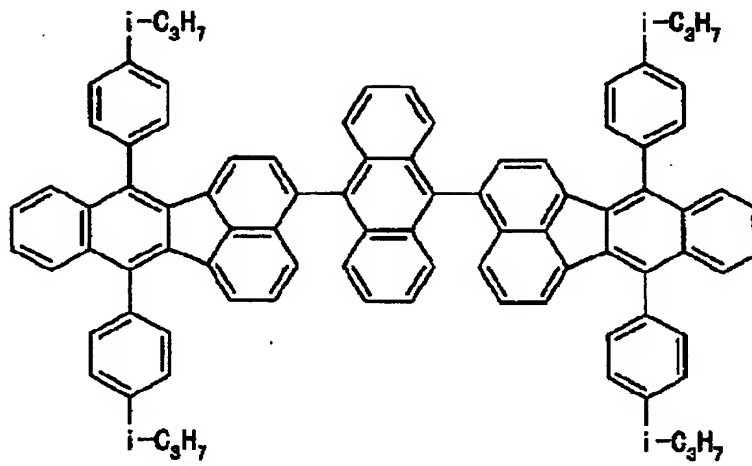
C-11



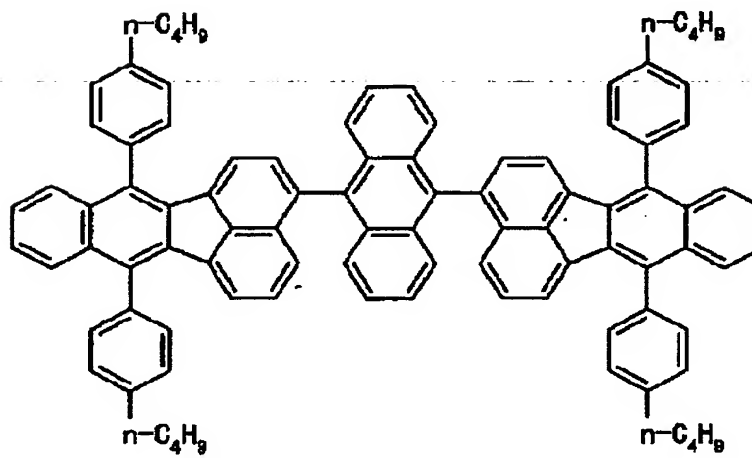
[0030]

[Formula 18]

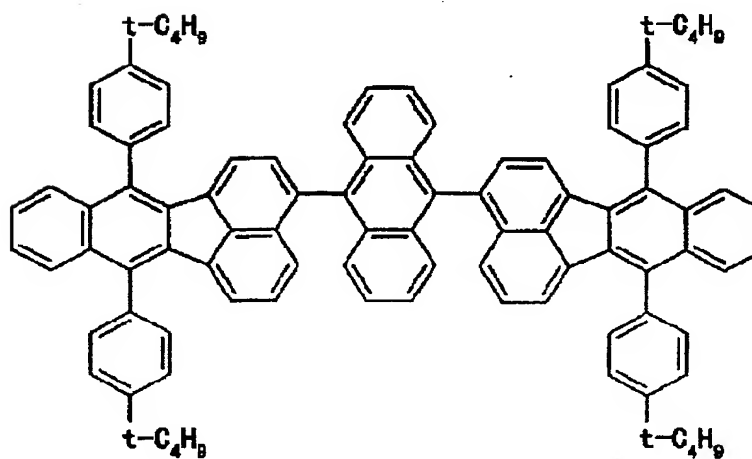
C-12



C-13



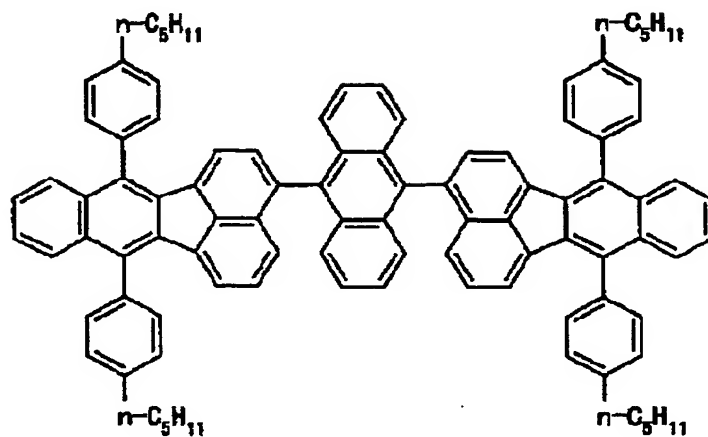
C-14



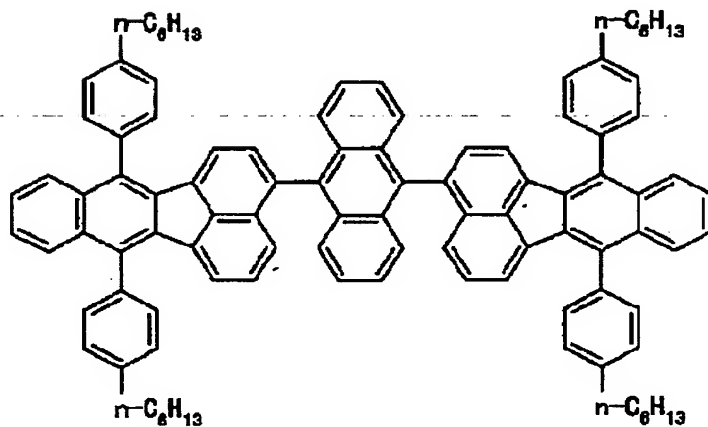
[0031]

[Formula 19]

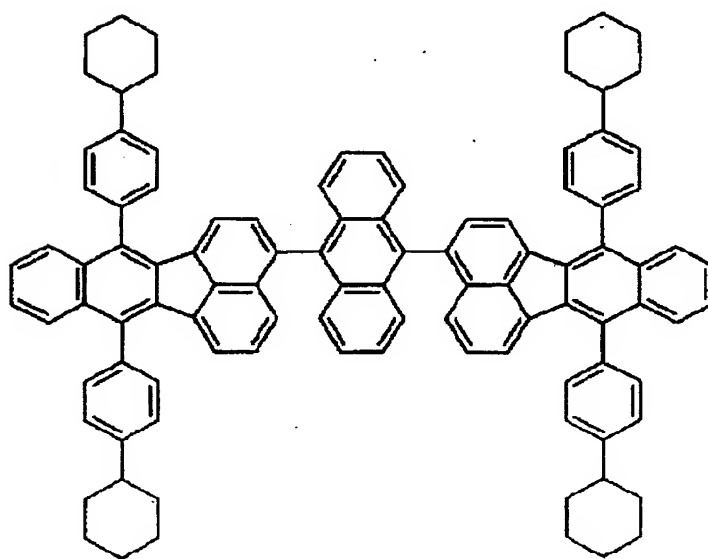
C-15



C-16



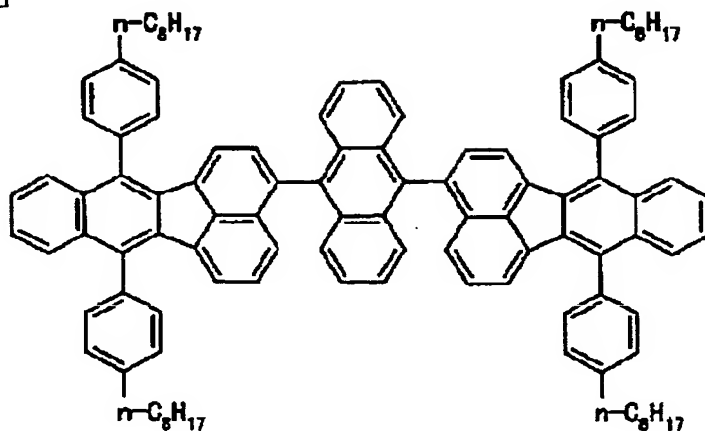
C-17



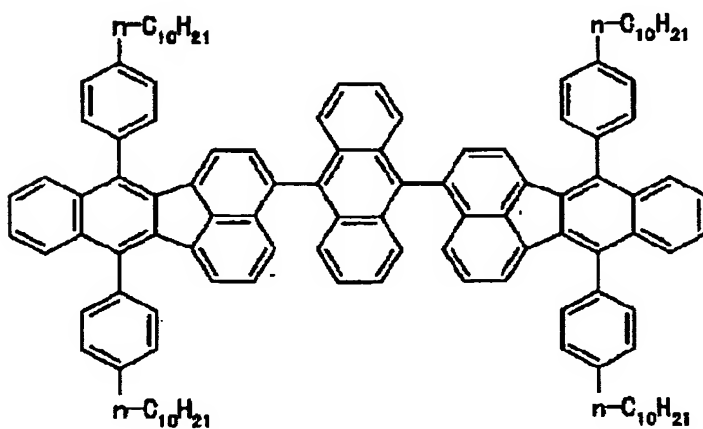
[0032]

[Formula 20]

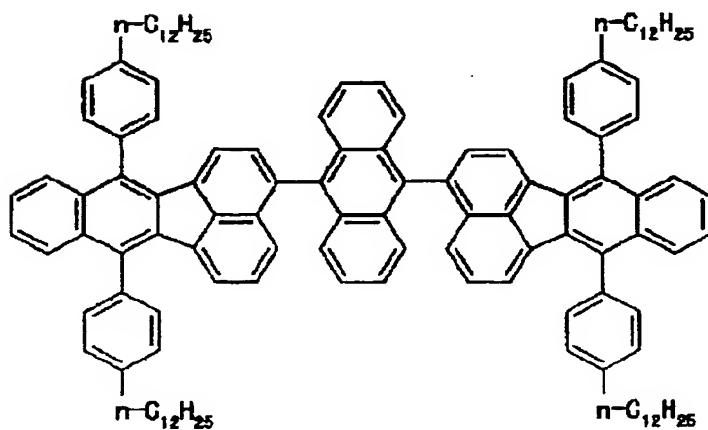
C-18



C-19



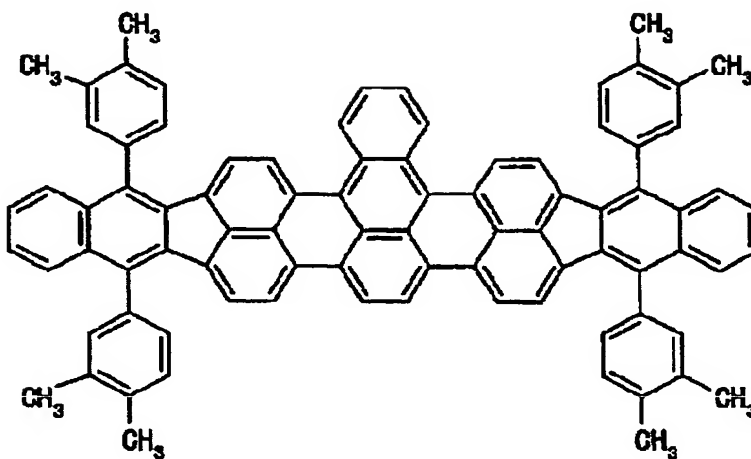
C-20



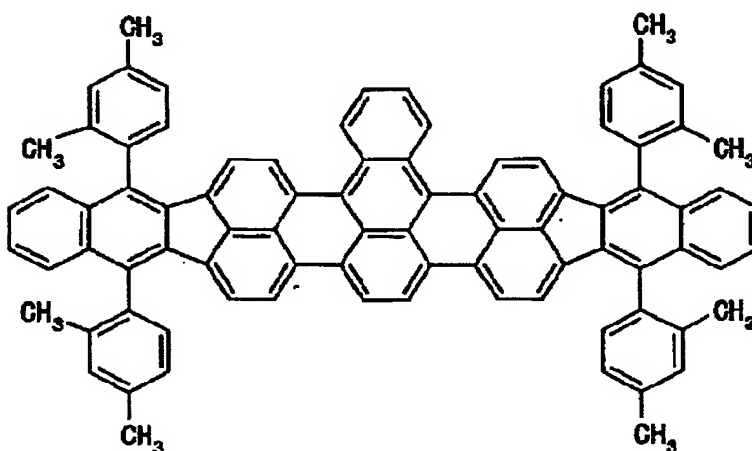
[0033]

[Formula 21]

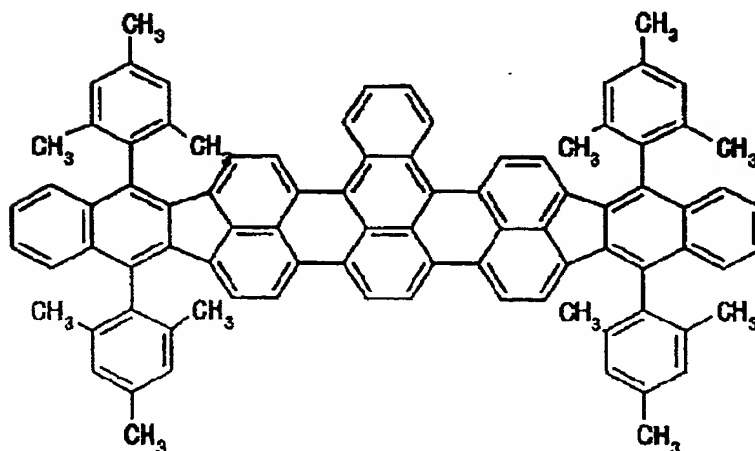
C-21



C-22



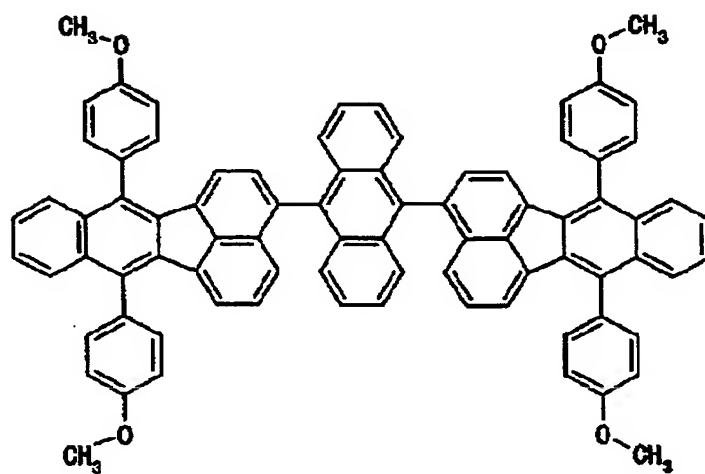
C-23



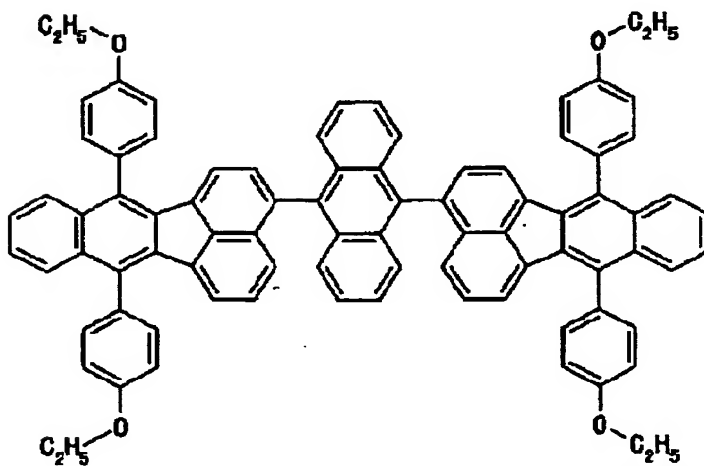
[0034]

[Formula 22]

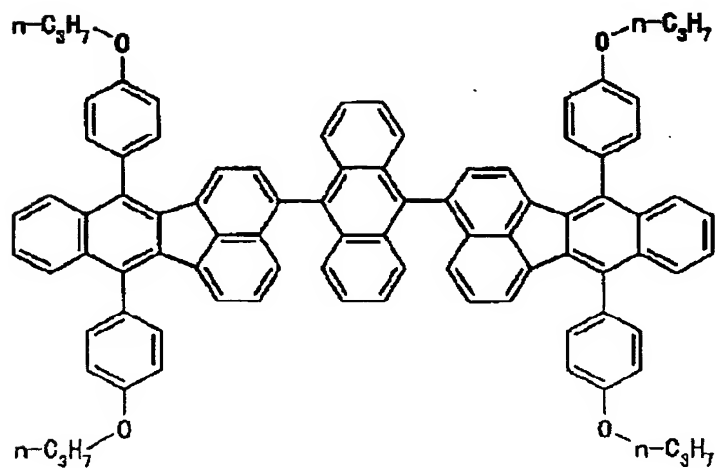
C-24



C-25

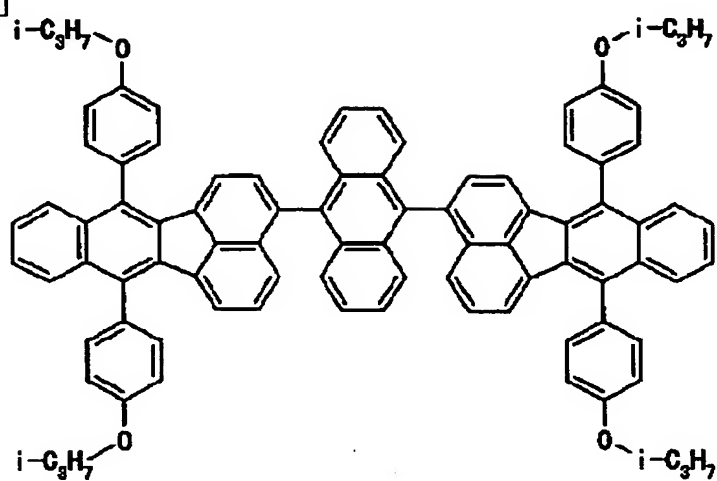


C-26

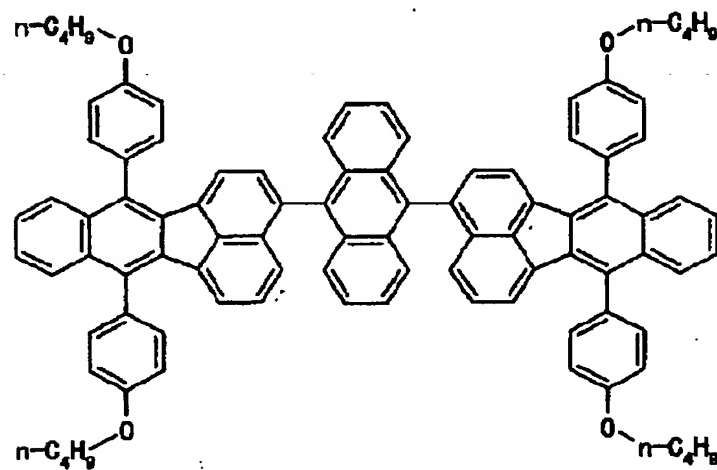


[Formula 23]

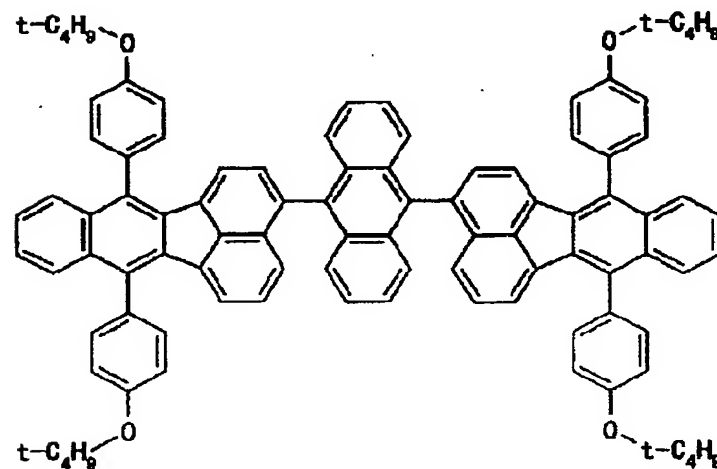
C-27



C-28



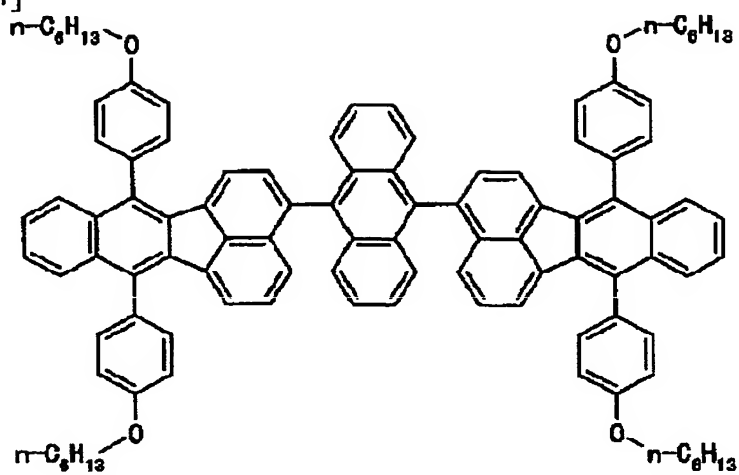
C-29



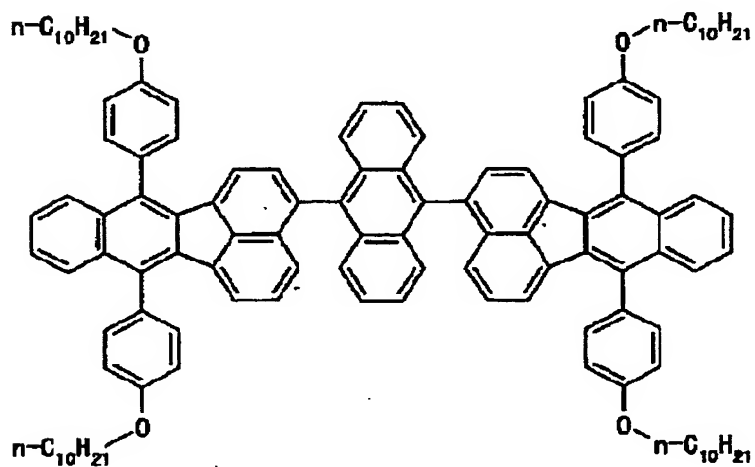
[0036]

[Formula 24]

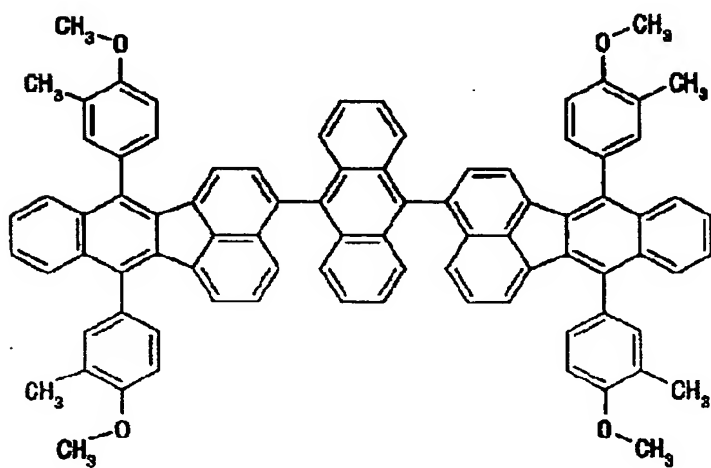
C-30



C-31



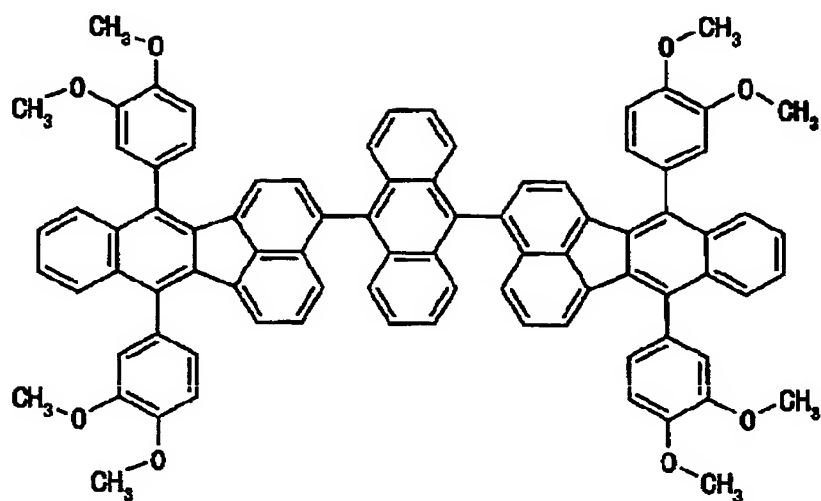
C-32



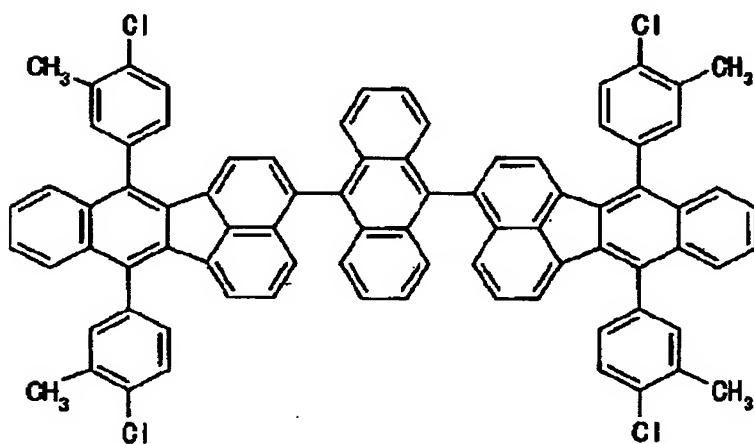
[0037]

[Formula 25]

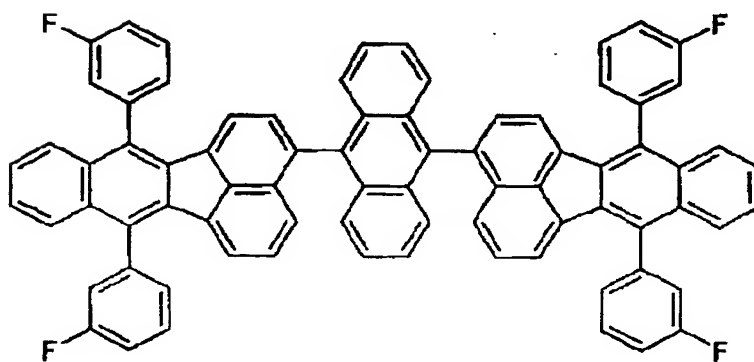
C-33



C-34



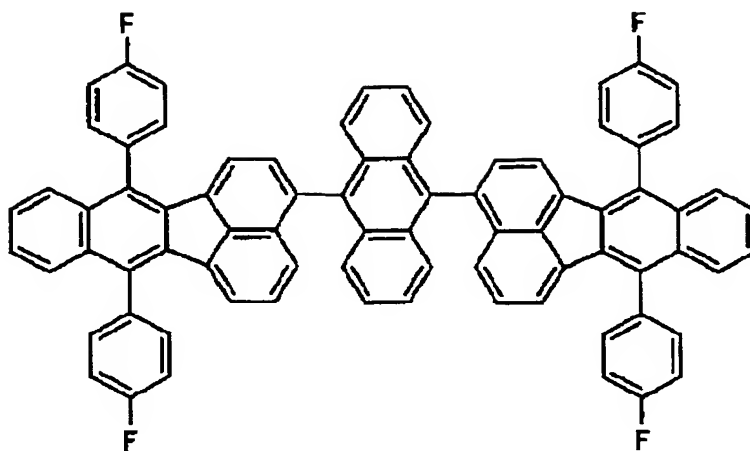
C-35



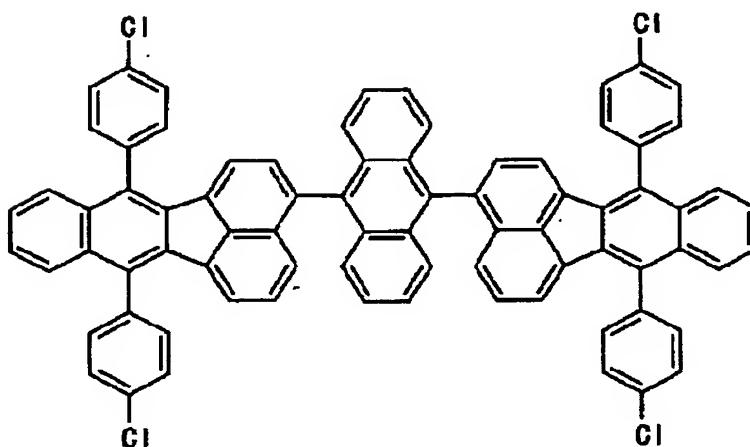
[0038]

[Formula 26]

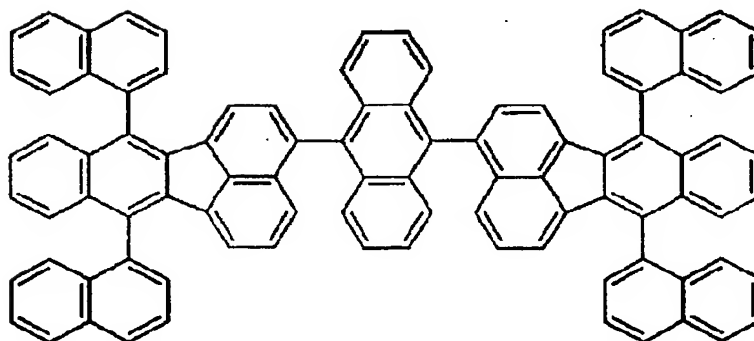
C-36



C-37



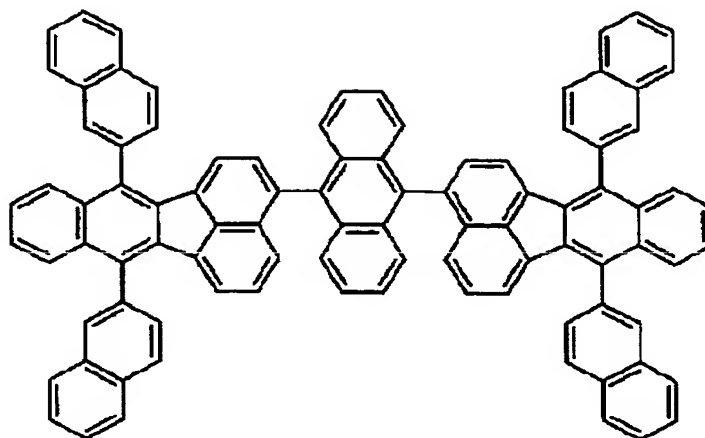
C-38



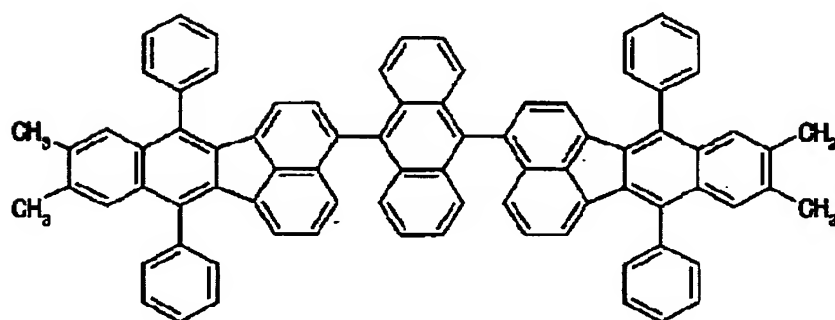
[0039]

[Formula 27]

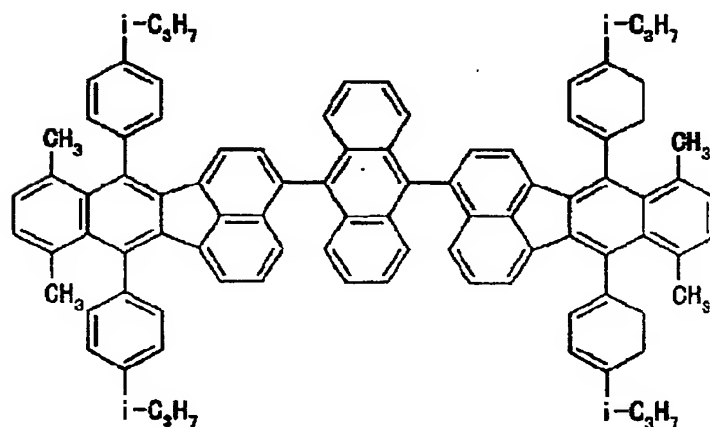
C-39



C-40



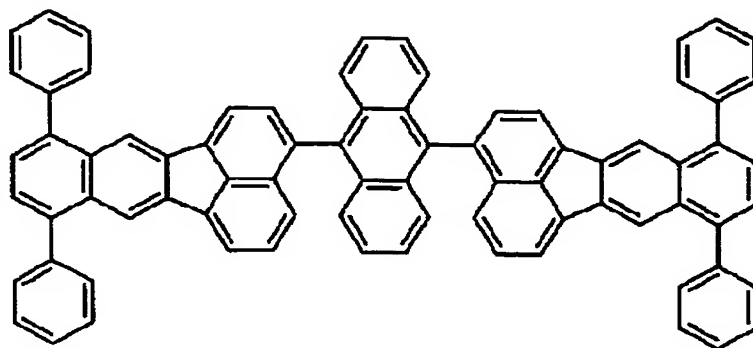
C-41



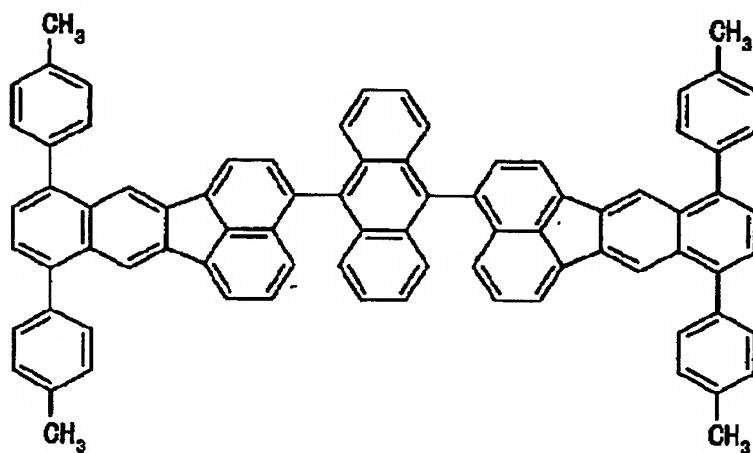
[0040]

[Formula 28]

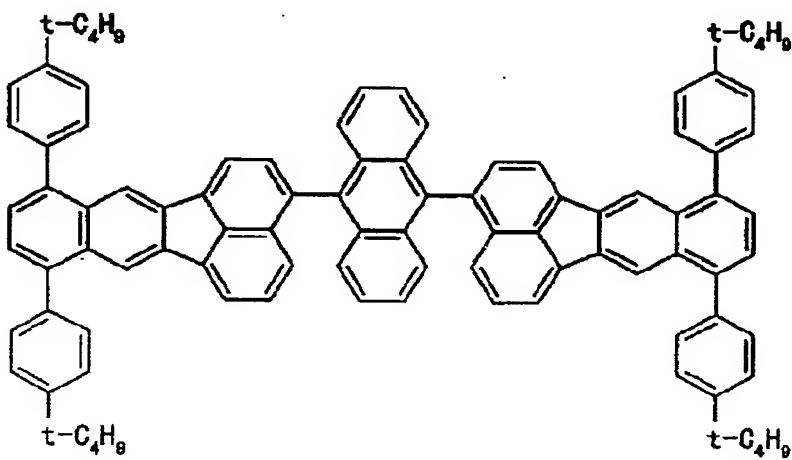
C-42



C-43



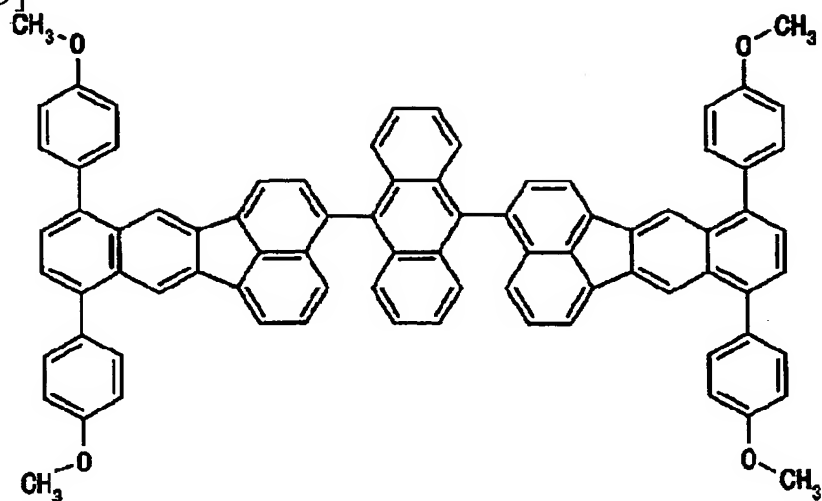
C-44



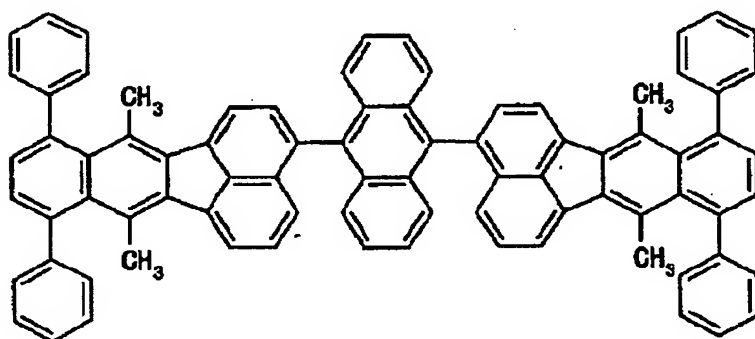
[0041]

[Formula 29]

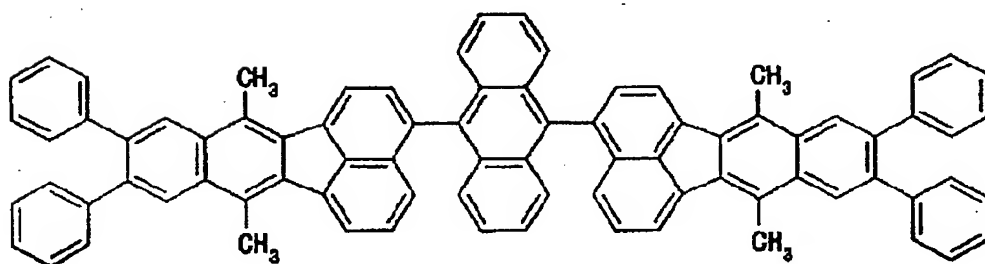
C-45



C-46



C-47



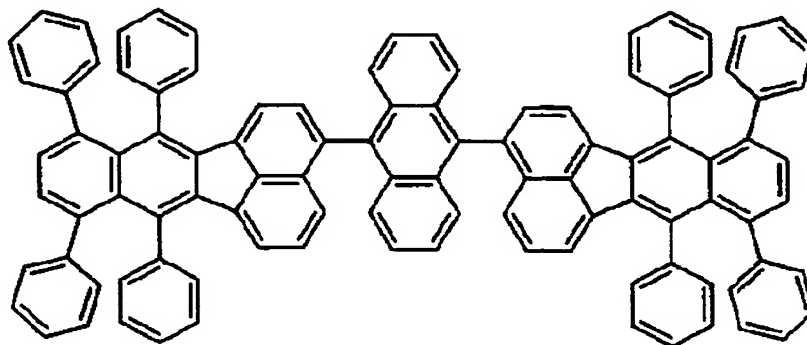
[Formula 30]



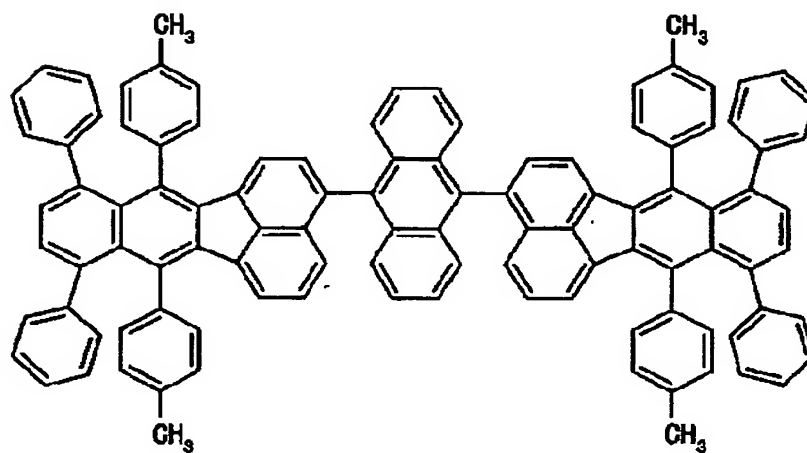
[0043]

[Formula 31]

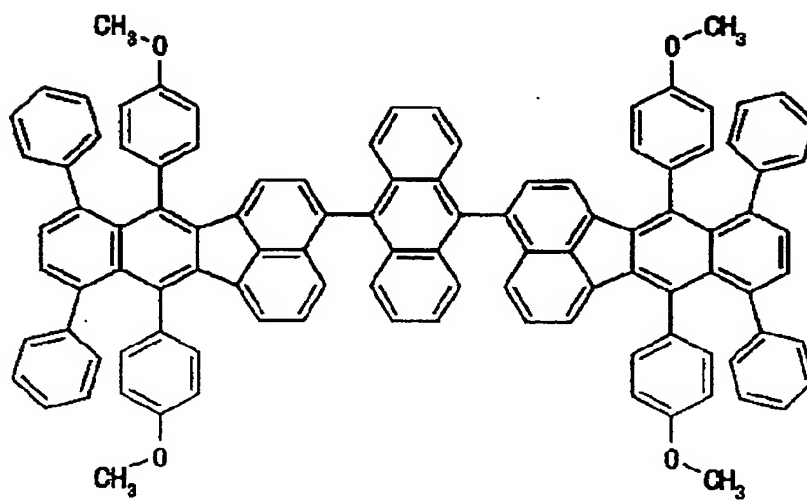
C-51



C-52



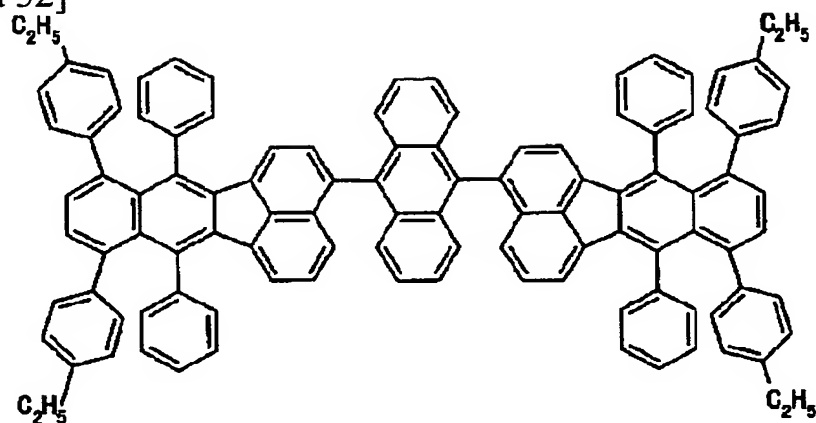
C-53



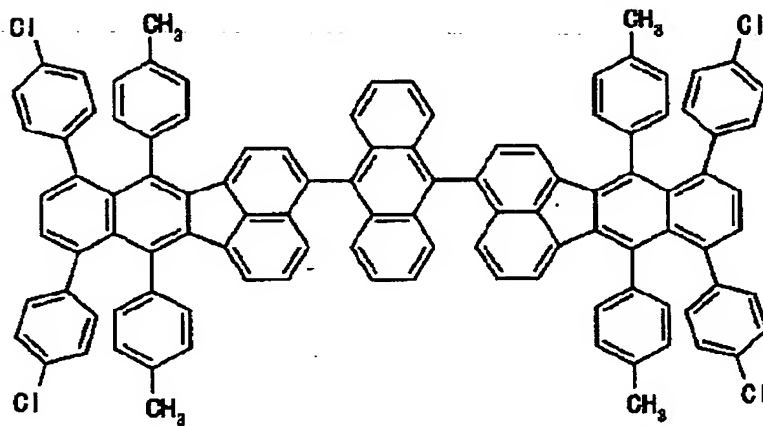
[0044]

[Formula 32]

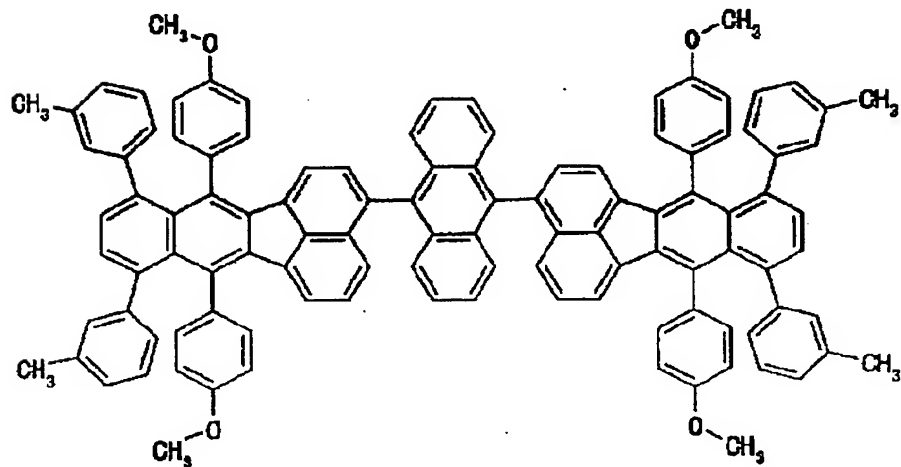
C-54



C-55



C-56

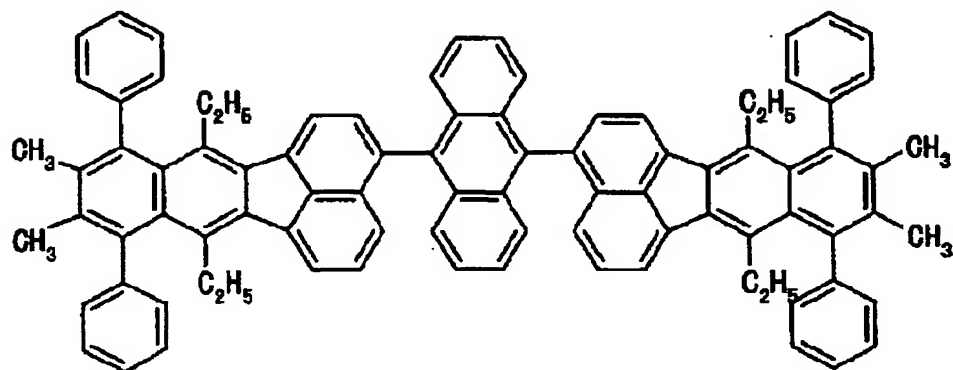


[0045]

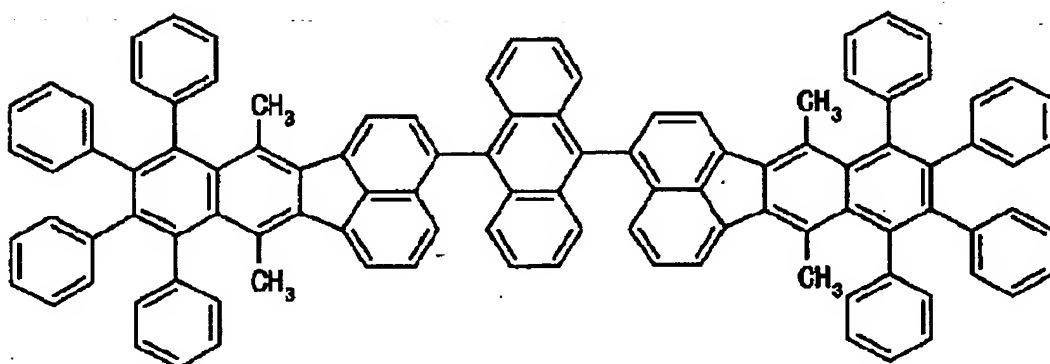
[Formula 33]

20

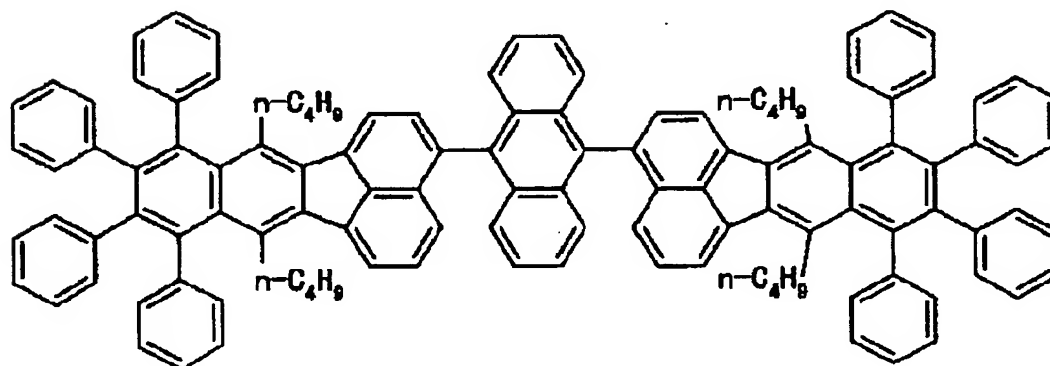
C-57



C-58

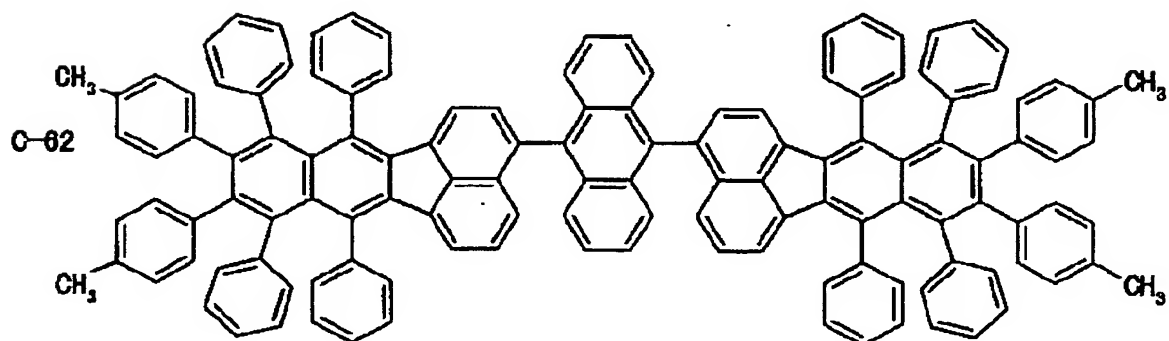
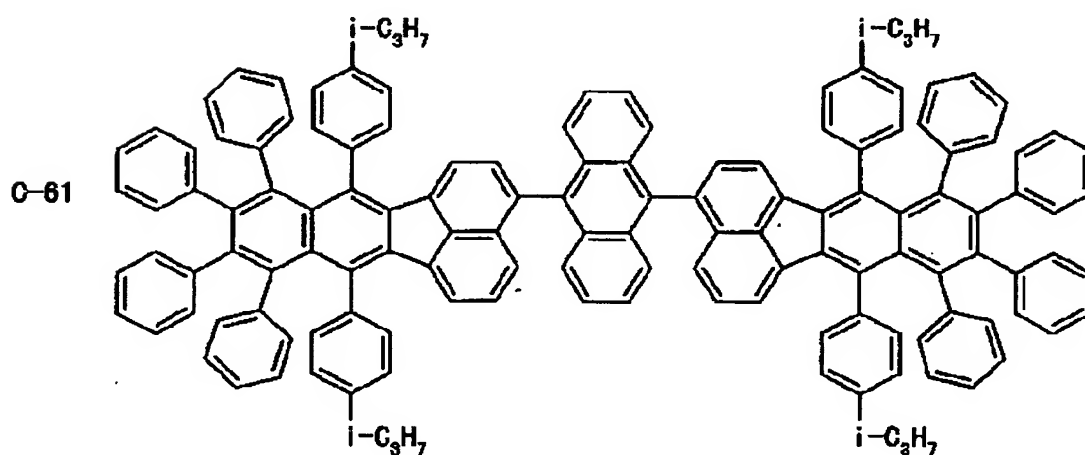
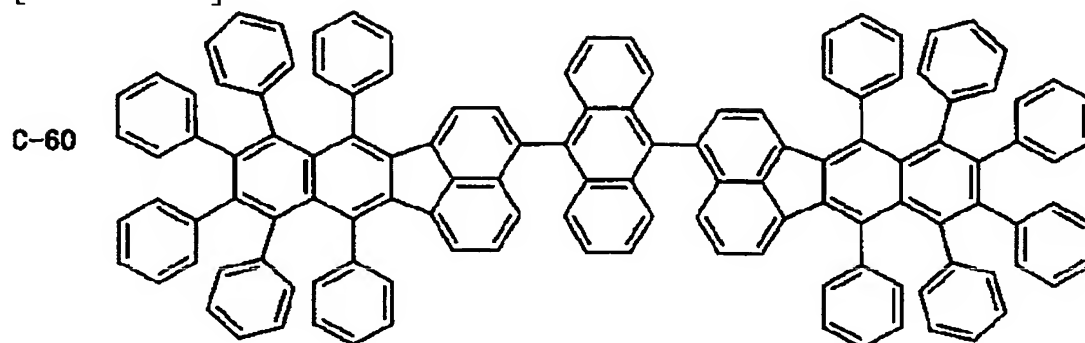


C-59



[0046]

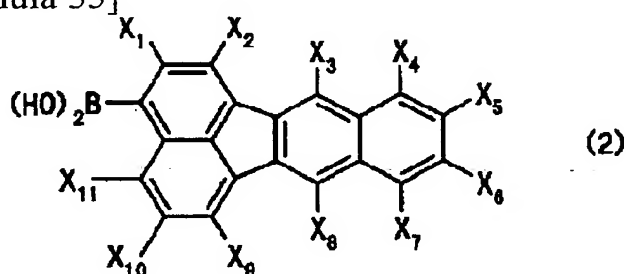
[Formula 34]



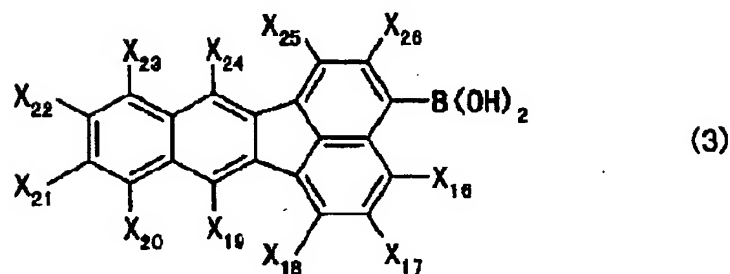
[0047] The compound A concerning this invention, for example, the compound expressed with a general formula (1-A), can be manufactured by the following approaches. Namely, benzoexpressed with a general formula (2) (** 35) and a general formula (3), and (** 35), for example [k] The dihalogeno anthracene derivative expressed with a general formula (4) and (** 35) in a fluoranthene-3-IRUHOU acid derivative, for example, a palladium compound -- [-- for example, tetrakis (triphenylphosphine) palladium -- it is made to react under existence of screw (triphenylphosphine) palladium chloride] and a base (for example, a sodium carbonate, a sodium hydrogencarbonate, triethylamine) -- [-- for example] which can refer to an approach given in Chem.Rev., 95, and 2457 (1995) -- it can manufacture by things.

[0048]

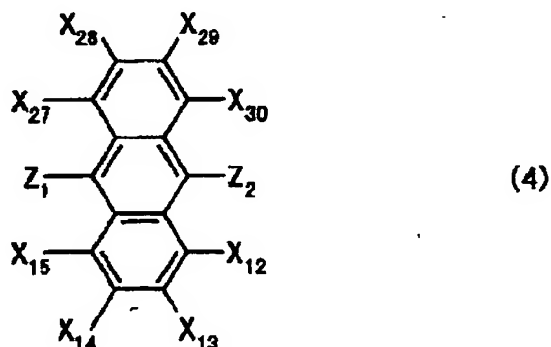
[Formula 35]



(2)



(3)



(4)

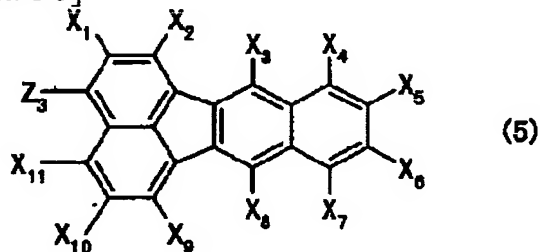
[X1 -X30 express the same semantics as the case of a general formula (1-A) among an upper type, and Z1 and Z2 express a halogen atom.]

It sets to a general formula (4) and is Z1. And Z2 A halogen atom is expressed and a chlorine atom, a bromine atom, and an iodine atom are expressed preferably.

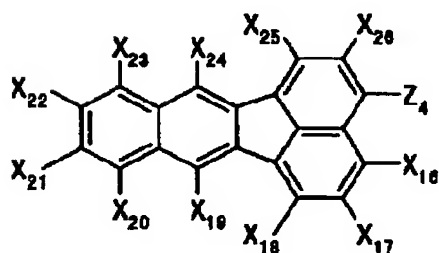
[0049] The compound expressed with a general formula (2) and a general formula (3) in addition, respectively From the compound expressed with a general formula (5) (** 36) and a general formula (6), and (** 36), for example, for example, the RICHIO compound or Grignard reagent which n-butyl lithium and metal magnesium are made to act and can be adjusted, For example, trimethoxy boron, triisopropoxy boron, etc. can adjust [for example, it can refer to an approach given in Chem.Rev., 95, and 2457 (1995)].

[0050]

[Formula 36]



(5)



(6)

[X1 - X11, and X16-X26 express the same semantics as the case of a general formula (1-A) among an upper type, and Z3 and Z4 express a halogen atom.] It sets to a general formula (5) and a general formula (6), and is Z3. And Z4 A halogen atom is expressed and a chlorine atom, a bromine atom, and an iodine atom are expressed preferably.

[0051] In addition, the compound expressed with a general formula (5) and a general formula (6) can be manufactured according to the approach of a publication to for example, J.Org.Chem., 62, and 530 (1997). That is, for example, it can manufacture by dehydrating a 5-halogeno acenaphthylene derivative and an iso benzofuran derivative after reacting. Moreover, the compound expressed with a general formula (5) and a general formula (6) is 3-halogeno cyclo PENTA [a]. It can manufacture by making an acenaphthylene-8-ON derivative and a benzyne derivative react [for example, it can refer to an approach given in Ind.J.Chem.Sect.B, 15B, and 32 (1977)].

[0052] Although the compound A concerning this invention may be manufactured in the form in which the solvation with the solvent (for example, aromatic hydrocarbon system solvents, such as toluene) used by the case was formed, in this invention, the compound A concerning this invention includes such solvate. Of course, the non-solvate which does not contain a solvent is also included. Such solvate can also be used for the organic

electroluminescence devices of this invention as well as the non-solvate of the compound A concerning this invention. In addition, when using the compound A concerning this invention for organic electroluminescence devices, it is desirable to use together the purification approaches, such as the recrystallizing method, the column-chromatography method, and a sublimation purification method, or these approaches, and to use the compound which raised purity.

[0053] Organic electroluminescence devices usually come at least to pinch the luminous layer which contains a kind of luminescence component at least in inter-electrode [of a pair] further. In consideration of each functional level of the hole injection of the compound used for a luminous layer and electron hole transportation, electron injection, and electronic transportation, the electron injection transportation layer containing the hole-injection transportation layer and/or electron injection transportation component containing a hole-injection transportation component can also be prepared according to a request. For example, when the hole-injection function of the compound used for a luminous layer, an electron hole transportation function and/or an electron injection function, and an electronic transportation function are good, a luminous layer can consider as the configuration of the component of the mold which served both as the hole-injection transportation layer and/or the electron injection transportation layer. Of course, it can also consider as the configuration of the component (much more component of a mold) of the mold which does not prepare the layer of both a hole-injection transportation layer and an electron injection transportation layer depending on the case. Moreover, a hole-injection transportation layer, an electron injection transportation layer, and each layer of a luminous layer may be structures much more, or may be multilayer structure, in each layer, the layer which has an impregnation function, and the layer which has a transportation function can be prepared separately, and a hole-injection transportation layer and an electron injection transportation layer can also constitute it.

[0054] In the organic electroluminescence devices of this invention, as for the compound A concerning this invention, it is desirable to use for a hole-injection transportation component, a luminescence component, or an electron injection transportation component, it is more desirable to use for a hole-injection transportation component or a luminescence component, and especially its thing used for a luminescence component is desirable. In the organic electroluminescence devices of this invention, the compound A concerning this invention may be used independently, or may be used together. [two or more]

[0055] Especially as a configuration of the organic electroluminescence devices of this invention, it cannot limit and (C) anode plate / luminous layer / electron injection transportation layer / cathode mold component (drawing 3), (D) anode plate / luminous layer / cathode mold component (drawing 4), etc. can be mentioned (drawing 2). (drawing 1) Furthermore, it can also consider as (E) anode plate / hole-injection transportation layer / electron injection

transportation layer / luminous layer / electron injection transportation layer / cathode mold component (drawing 5) which is a component of the mold which put the luminous layer in the electron injection transportation layer. (D) Although the component of the mold which made inter-electrode [of a pair] pinch a luminescence component with a gestalt further is included as a component configuration of a mold Furthermore, for example, the component of the mold which it made inter-electrode [of a pair] pinch with the one-layer gestalt which mixed (F) hole-injection transportation component, the luminescence component, and the electron injection transportation component (drawing 6), (G) There is a component (drawing 8) of the mold which it made inter-electrode [of a pair] pinch with the one-layer gestalt which mixed the component (drawing 7), (H) luminescence component, and the electron injection transportation component of the mold which it made inter-electrode [of a pair] pinch with the one-layer gestalt which mixed the hole-injection transportation component and the luminescence component.

[0056] In the organic electroluminescence devices of this invention, it cannot restrict to these component configurations and a hole-injection transportation layer, a luminous layer, and a two or more layers electron injection transportation layer can be prepared in each type of component. Moreover, in each type of component, the mixolimnion of a luminescence component and an electron injection transportation component can also be prepared between a hole-injection transportation layer and a luminous layer between the mixolimnion of a hole-injection transportation component and a luminescence component and/or a luminous layer, and an electron injection transportation layer. The configuration of more desirable organic electroluminescence devices is (A) mold component, (B) mold component, (C) mold component, (E) mold component, (F) mold component, (G) mold component, or (H) mold component, and is (A) mold component, (B) mold component, (C) mold component, (F) mold component, or (H) mold component still more preferably.

[0057] As organic electroluminescence devices of this invention, (A) anode plate / hole-injection transportation layer / luminous layer / electron injection transportation layer / cathode mold component shown in (drawing 1) are explained. (drawing 1) -- setting -- 1 -- a substrate and 2 -- in an anode plate and 3, an electron injection transportation layer and 6 show cathode, and, as for a hole-injection transportation layer and 4, 7 shows a power source, as for a luminous layer and 5.

[0058] Being supported by the substrate 1 is desirable, especially as a substrate, although the electroluminescence devices of this invention are not limited, transparence thru/or a translucent thing are desirable [electroluminescence devices], for example, they can mention what consists of a compound sheet which combined a glass plate, a transparence sheet plastic (for example, sheets, such as polyester, a polycarbonate, polysulfone, polymethylmethacrylate, polypropylene, and polyethylene), a translucent sheet plastic, a quartz,

transparence SERAMIKUSSU, or these. Furthermore, the luminescent color is also controllable to a substrate combining for example, the color filter film, the color conversion film, and the dielectric reflective film.

[0059] As an anode plate 2, it is desirable to use a metal with a comparatively large work function, an alloy, or an electrical conductivity compound as electrode material. As electrode material used for an anode plate, gold, platinum, silver, copper, cobalt, nickel, palladium, vanadium, a tungsten, tin oxide, a zinc oxide, ITO (indium Tin oxide), the poly thiophene, polypyrrole, etc. can be mentioned, for example. Such electrode material may be used independently or may be used together. [two or more] An anode plate can be formed on a substrate by approaches, such as vacuum deposition and the sputtering method, using such electrode material. Moreover, an anode plate may be structure much more, or may be multilayer structure. The sheet electric resistance of an anode plate is more preferably set as 5-50ohms / ** extent below hundreds of ohms / **. Although the thickness of an anode plate is based also on the ingredient of the electrode material to be used, generally it is more preferably set as about 10-500nm about 5-1000nm.

[0060] The hole-injection transportation layer 3 is a layer containing the compound which has the function to convey the electron hole which makes easy impregnation of the electron hole (hole) from an anode plate, and which was functioned and poured in. A hole-injection transportation layer can be formed using the compounds (for example, a phthalocyanine derivative, a thoria reel methane derivative, a thoria reel amine derivative, an oxazole derivative, a hydrazone derivative, a stilbene derivative, a pyrazoline derivative, a polysilane derivative, polyphenylene vinylene and its derivative, the poly thiophene and its derivative, a Polly N-vinylcarbazole derivative, etc.) which have the compound A and/or other hole-injection transportation functions concerning this invention at least one sort. In addition, the compound which has a hole-injection transportation function may be used independently, or may be used together. [two or more]

[0061] As a compound which has other hole-injection transportation functions to use in this invention a thoria reel amine derivative (for example, 4 and 4' screw [-] [N-phenyl-N-(4"-methylphenyl) amino] biphenyl --) 4 and 4' screw [-] [N-phenyl-N-(3"-methylphenyl) amino] biphenyl, 4 and 4' screw [-] [N-phenyl-N-(3"-methoxyphenyl) amino] biphenyl, 4 and 4' screw [-] [N-phenyl-N-(1"-naphthyl) amino] biphenyl, 3 and 3' -- the - dimethyl -4 and 4' - screw [N-phenyl-N-(3"-methylphenyl) amino] biphenyl -- 1 and 1-screw [4'-[N and N-JI (4"-methylphenyl) amino] phenyl] cyclohexane, 9, 10-screw [N-(4'-methylphenyl)-N-(4"-n-buthylphenyl) amino] phenanthrene, 3, 8-screw (N and N-diphenylamino)-6-phenyl phenanthridine, four - methyl - N -- N - a screw -- [-- four -- " -- four -- ' -- ' -- ' - a screw -- [-- N -- ' -- N -- ' - JI (4-methylphenyl) -- amino --] -- a biphenyl - four - IRU --] -- an aniline -- N, N'-screw [4-(diphenylamino) phenyl]-N, N'-diphenyl -1, 3-diaminobenzene, N,

N'-screw [4-(diphenylamino) phenyl]-N, N'-diphenyl -1, 4-diaminobenzene, 5 and 5''-screw [4-(screw [4-methylphenyl] amino) phenyl]-2, 2':5', 2''-TACHIOFEN, 1, 3, 5-tris (diphenylamino) benzene, 4, 4', a 4''-tris (N-cull BAZORIIRU) triphenylamine, 4, 4', a 4''-tris [N-(3'''-methylphenyl)-N-phenylamino] triphenylamine, 4, 4', 4''-tris [N and N-screw (4'''-tert-butyl biphenyl-4'''-IRU) amino] triphenylamine, The poly thiophene and its derivatives, such as 1, 3, and 5-tris [N-(4'-diphenyl aminophenyl)-N-phenylamino] benzene, and a Polly N-vinylcarbazole derivative are desirable. When using together the compound A concerning this invention, and the compound which has other hole-injection transportation functions, the rate of the compound A concerning this invention occupied in a hole-injection transportation layer is preferably prepared to about 0.1 - 40% of the weight.

[0062] A luminous layer 4 is a layer containing the compound which has an electron hole and electronic impregnation functions, those transportation functions, and the function to make the recombination of an electron hole and an electron generate an exciton. the compound (for example, an acridone derivative, the Quinacridone derivative, a diketo pyrrolo pyrrole derivative, and a polynuclear aromatic compound -- [-- for example) which has the compound A and/or other luminescence functions which a luminous layer requires for this invention Rubrene, an anthracene, tetracene, a pyrene, perylene, a chrysene, Deca cyclene, coronene, a tetra-phenyl cyclopentadiene, PENTA phenyl cyclohexadiene, 9, 10-diphenyl anthracene, 9, 10-screw (phenyl ethynyl) anthracene, 1, 4-screw (9'-ethynyl anthracenyl) benzene, 4, and 4'-screw (9''-ethynyl anthracenyl) biphenyl] and a thoria reel amine derivative -- [-- for example] which can mention the compound mentioned above as a compound which has a hole-injection transportation function, and an organometallic complex -- [-- for example Tris (8-quinolilato) aluminum, screw (10-benzo[h] quinolate) beryllium, The zinc salt of 2-(2'-hydroxyphenyl) benzooxazole, the zinc salt of 2-(2'-hydroxyphenyl) benzothiazole, the zinc salt of a 4-hydroxy acridine, the zinc salt of a 3-hydroxy flavone, the beryllium salt of a 5-hydroxy flavone, aluminum salt [of a 5-hydroxy flavone]], and a stilbene derivative -- {-- for example one -- one -- four -- four - tetra--- phenyl - 1,3-butadiene -- four -- four -- ' - a screw (2 and 2-diphenyl vinyl) -- a biphenyl -- four -- four -- ' - a screw -- [(1, 1, 2-triphenyl) -- ethenyl --] -- a biphenyl --} -- [-- 0063 --] a coumarin derivative -- [-- for example A coumarin 1, a coumarin 6, a coumarin 7, a coumarin 30, a coumarin 106, a coumarin 138, a coumarin 151, a coumarin 152, a coumarin 153, a coumarin 307, a coumarin 311, a coumarin 314, a coumarin 334, a coumarin 338, a coumarin 343, coumarin 500], a pyran derivative ([DCM1, DCM2]), and oxazone derivative -- [-- for example, [for example,] Nile red], a benzothiazole derivative, a benzooxazole derivative, A benzimidazole derivative, a pyrazine derivative, a cinnamate derivative, Polly N-vinylcarbazole and its derivative, the poly thiophene, and its derivative,

Polyphenylene and its derivative, the poly fluorene, and its derivative, Polyphenylene vinylene and its derivative, poly biphenylene vinylene, and its derivative, At least one sort can be formed using poly terphenylene vinylene and its derivative, poly naphthylene vinylene and its derivative, poly thienylene vinylene, its derivative, etc.

[0064] In the organic electroluminescence devices of this invention, it is desirable to contain the compound A which starts this invention at a luminous layer. When using together the compound A concerning this invention, and the compound which has other luminescence functions, the rate of the compound A concerning this invention occupied in a luminous layer is more preferably prepared to about 0.1 - 99.9% of the weight still more preferably about 0.01 to 99.99% of the weight about 0.001 to 99.999% of the weight.

[0065] As a compound which has other luminescence functions to use in this invention, a luminescent organometallic complex is desirable. For example, a luminous layer can also consist of a host compound and a guest compound (dopant) like a publication in J.Appl.Phys., 65, 3610 (1989), and JP,5-214332,A. A luminous layer can be formed using the compound A concerning this invention as a host compound, further, it can use as a guest compound and a luminous layer can also be formed. When forming a luminous layer, using the compound A concerning this invention as a guest compound, as a host compound, the compound which has other aforementioned luminescence functions can be mentioned, for example, for example, a luminescent organometallic complex or a thoria reel amine is more desirable. In this case, to a luminescent organometallic complex or a thoria reel amine derivative, the compound A concerning this invention is depended and is used especially about 0.1 to 20% of the weight about 0.01 to 30% of the weight about 0.001 to 40% of the weight preferably.

[0066] Especially as a luminescent organometallic complex used together with the compound A concerning this invention, although it does not limit, a luminescent organic aluminum complex is desirable and the luminescent organic aluminum complex which has 8-quinolate ligand which is not permuted [a permutation or] is more desirable. As a luminescent desirable organometallic complex, the luminescent organic aluminum complex expressed with a general formula (a) - a general formula (c) can be mentioned, for example.

(Q)3 -Al (a)

(Q expresses among a formula 8-quinolate ligand which is not permuted [a permutation or])

(Q)2 -Al-O-L (b)

(Q expresses a permutation 8-quinolate ligand among a formula, O-L is a phenolate ligand and L expresses the hydrocarbon group of the carbon numbers 6-24 containing a phenyl part)

(Q)2 -Al-O-Al-(Q)2 (c)

(Q expresses a permutation 8-quinolate ligand among a formula)

As an example of a luminescent organometallic complex, it is tris (8-quinolate) aluminum, tris (4-methyl-8-quinolate) aluminum, tris (5-methyl-8-quinolate) aluminum, tris (3, 4-dimethyl-8-quinolate) aluminum, tris (4, 5-dimethyl-8-quinolate) aluminum, tris (4, 6-dimethyl-8-quinolate) aluminum, and [0067], for example. Screw (2-methyl-8-quinolate) (phenolate) aluminum, Screw (2-methyl-8-quinolate) (2-methyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3-methyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (4-methyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2-phenyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3-phenyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (4-phenyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 3-dimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 6-dimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3, 4-dimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3, 5-dimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (3, 5-G tert-butyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 6-diphenyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 4, 6-triphenyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 4, 6-trimethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (2, 4, 5, 6-tetramethyl phenolate) aluminum, Screw (2-methyl-8-quinolate) (1-naphth RATO) aluminum, Screw (2-methyl-8-quinolate) (2-naphth RATO) aluminum, Screw (2, 4-dimethyl-8-quinolate) (2-phenyl phenolate) aluminum, Screw (2, 4-dimethyl-8-quinolate) (3-phenyl phenolate) aluminum, Screw (2, 4-dimethyl-8-quinolate) (4-phenyl phenolate) aluminum, Screw (2, 4-dimethyl-8-quinolate) (3, 5-dimethylphenyl phenolate) aluminum, screw (2, 4-dimethyl-8-quinolate) (3, 5-G tert-buthylphenyl phenolate) aluminum, [0068] Screw (2-methyl-8-quinolate) aluminum-mu-oxo--screw (2-methyl-8-quinolate) aluminum, Screw (2, 4-dimethyl-8-quinolate) aluminum-mu-oxo--screw (2, 4-dimethyl-8-quinolate) aluminum, Screw (2-methyl-4-ethyl-8-quinolate) aluminum-mu-oxo--screw (2-methyl-4-ethyl-8-quinolate) aluminum, Screw (2-methyl-4-methoxy-8-quinolate) aluminum-mu-oxo--screw (2-methyl-4-methoxy-8-quinolate) aluminum, Screw (2-methyl-5-cyano-8-quinolate) aluminum-mu-oxo--screw (2-methyl-5-cyano-8-quinolate) aluminum, Screw (2-methyl-5-trifluoromethyl-8-quinolate) aluminum-mu-oxo--screw (2-methyl-5-trifluoromethyl-8-quinolate) aluminum etc. can be mentioned. Of course, a luminescent organometallic complex may be used independently or may be used together. [two or more]

[0069] The electron injection transportation layer 5 is a layer containing the compound which has the function to convey the electron which makes impregnation of the electron from cathode easy, and which was functioned and

poured in. the compound (for example, an organometallic complex -- [-- for example) which has the compound A and/or other electron injection transportation functions which an electron injection transportation layer requires for this invention Tris (8-quinolate) aluminum, screw (10-benzo[h] quinolate) beryllium, the beryllium salt of a 5-hydroxy flavone, aluminum salt [of a 5-hydroxy flavone]], and an OKISA diazole derivative -- [-- for example 1 and 3-screw [-- 5'-(p-tert-buthylphenyl)- 1, 3, and 4-OKISA diazole-2' - IRU] benzene] and a triazole derivative -- [-- for example 3-(4'-tert-buthylphenyl)-4-phenyl-5-(4"-biphenyl)- 1, 2, and 4-triazole] -- a triazine derivative, a perylene derivative, a quinoline derivative, a quinoxaline derivative, a diphenyl quinone derivative, and nitration full -- me -- non, at least one sort can be formed using a derivative, a thiopyran dioxide derivative, etc. [0070] When using together the compound A concerning this invention, and the compound which has other electron injection transportation functions, the rate of the compound A concerning this invention occupied in an electron injection transportation layer is preferably prepared to about 0.1 - 40% of the weight. In this invention, it is desirable to use together the compound A and the organometallic complex [for example, the compound expressed with said general formula (a) - a general formula (c)] concerning this invention, and to form an electron injection transportation layer.

[0071] As cathode 6, it is desirable to use a metal with a comparatively small work function, an alloy, or an electrical conductivity compound as electrode material. As electrode material used for cathode, a lithium and lithium-indium alloy, sodium, and sodium-potassium alloy, calcium, magnesium, and magnesium-silver alloy, a magnesium-indium alloy, an indium, a ruthenium, titanium, manganese, an yttrium, aluminum, an aluminium-lithium alloy, an aluminum-calcium alloy, an aluminum magnesium alloy, a graphite thin film, etc. can be mentioned, for example. Such electrode material may be used independently or may be used together. [two or more] Cathode can be formed on an electron injection transportation layer by approaches, such as vacuum deposition, the sputtering method, ionization vacuum deposition, the ion plating method, and the ionized cluster beam method, using such electrode material. Moreover, cathode may be structure much more or may be multilayer structure. In addition, as for the sheet electric resistance of cathode, it is desirable to set to below hundreds of ohms / **. Although the thickness of cathode is based also on the ingredient of the electrode material to be used, generally it is more preferably set as about 10-500nm about 5-1000nm. In addition, in order to take out luminescence of organic electroluminescence devices efficiently, it is desirable to be transparence thru/or that one [at least] electrode of an anode plate or cathode is translucent, and it is more desirable to set up the ingredient of an anode plate and thickness generally, so that the permeability of luminescence light may become 70% or more.

[0072] moreover, the organic electroluminescence devices of this invention --

setting -- the -- the singlet oxygen quencher may contain in inside further at least. Especially as a singlet oxygen quencher, it does not limit, and rubrene, a nickel complex, diphenyl iso benzofuran, etc. are mentioned, for example, it is rubrene especially preferably. Especially as a layer which the singlet oxygen quencher contains, although it does not limit, it is a luminous layer or a hole-injection transportation layer, and is a hole-injection transportation layer more preferably. In addition, for example, when making a hole-injection transportation layer contain a singlet quencher, homogeneity may be made to contain in a hole-injection transportation layer, and you may make it contain near a hole-injection transportation layer and the adjoining layer (for example, a luminous layer, the electron injection transportation layer which has a luminescence function). 0.01- of the amount of whole which constitutes the layer (for example, hole-injection transportation layer) to contain as a content of a singlet oxygen quencher -- it is 0.1 - 20 % of the weight more preferably 0.05 to 30% of the weight 50% of the weight.

[0073] Especially concerning the formation approach of a hole-injection transportation layer, a luminous layer, and an electron injection transportation layer, it cannot limit and can create by forming a thin film by vacuum evaporation technique, ionization vacuum deposition, and the solution applying methods (for example, a spin coat method, the cast method, a dip coating method, the bar coat method, the roll coat method, a Langmuir-Blodgett method, the ink jet method, etc.) for example. Although especially the conditions of vacuum deposition are not limited when forming each class with a vacuum deposition method, it is 10-5 Torr. Under the vacuum of extent, it is 0.005 - 50 nm/sec at the boat temperature (source temperature of vacuum evaporations) of about 50-600 degrees C, and the substrate temperature of about -50-300 degrees C. It is desirable to carry out with the evaporation rate of extent.

[0074] In this case, each class, such as a hole-injection transportation layer, a luminous layer, and an electron injection transportation layer, can manufacture the organic electroluminescence devices which were further excellent in many properties by forming continuously under a vacuum. When forming each class, such as a hole-injection transportation layer, a luminous layer, and an electron injection transportation layer, with a vacuum deposition method using two or more compounds, it is desirable that carry out temperature control of each boat into which the compound was put, and it carries out vapor codeposition according to an individual.

[0075] By the solution applying method, when you form each class, a solvent is dissolved or distributed and let the component which forms each class, or its component and binder resin be coating liquid. As binder resin which can be used for each class of a hole-injection transportation layer, a luminous layer, and an electron injection transportation layer For example, Polly N-vinylcarbazole, polyarylate, polystyrene, Polyester, a polysiloxane,

polymethyl acrylate, polymethylmethacrylate, A polyether, a polycarbonate, a polyamide, polyimide, polyamidoimide, Poly paraxylene, polyethylene, polyphenylene oxide, polyether sulfone, High molecular compounds, such as the poly aniline and its derivative, the poly thiophene and its derivative, polyphenylene vinylene and its derivative, the poly fluorene and its derivative, poly thienylene vinylene, and its derivative, are mentioned. Binder resin may be used independently or may be used together. [two or more]

[0076] When forming each class by the solution applying method, the component which forms each class, or its component and binder resin a suitable organic solvent (for example, a hexane, an octane, Deccan, and toluene --)

Hydrocarbon system solvents, such as a xylene, ethylbenzene, and 1-methylnaphthalene, For example, an acetone, a methyl ethyl ketone, methyl isobutyl ketone, Ketone solvent, for example, dichloromethane, such as a cyclohexanone, chloroform, Tetrachloromethane, a dichloroethane, trichloroethane, tetrachloroethane, Halogenated hydrocarbon system solvents, such as a chlorobenzene, a dichlorobenzene, and chloro toluene, For example, ester solvent, such as ethyl acetate, butyl acetate, and amyl acetate, For example, a methanol, propanol, a butanol, a pentanol, a hexanol, Alcoholic solvent, such as a cyclohexanol, methyl cellosolve, ethylcellosolve, and ethylene glycol, For example, ether system solvents, such as dibutyl ether, a tetrahydrofuran, dioxane, and an anisole, For example,

N,N-dimethylformamide, N,N-dimethylacetamide, A polar solvent and/or water, such as a 1-methyl-2-pyrrolidone, 1-methyl-2-imidazolidinone, and dimethyl sulfoxide, can be dissolved or distributed, it can consider as coating liquid, and a thin film can be formed by various kinds of applying methods.

[0077] In addition, especially as an approach of distributing, although it does not limit, it can distribute in the shape of a particle using a ball mill, a sand mill, a paint shaker, attritor, a homogenizer, etc., for example. It cannot limit, can be set as the density range suitable for creating desired thickness by the applying method to enforce, especially concerning the concentration of coating liquid, and, generally is about 1 - 30% of the weight of solution concentration preferably about 0.1 to 50% of the weight. In addition, although it does not restrict especially concerning the amount used when using binder resin, generally it sets up to about 15 - 90% of the weight more preferably about 10 to 99.9% of the weight about 5 to 99.9% of the weight to the component which forms each class (receiving the total amount of each component, in forming the component of a mold further).

[0078] Although it does not limit especially concerning the thickness of a hole-injection transportation layer, a luminous layer, and an electron injection transportation layer, generally it is desirable to set it as 5nm - about 5 micrometers. In addition, to the produced component, a protective layer (closure layer) can be prepared, and a component can be enclosed into inactive substances, such as paraffin, a liquid paraffin, a silicone oil, a fluorocarbon oil,

and a zeolite content fluorocarbon oil, and can be protected in order to prevent contact for oxygen or moisture. As an ingredient used for a protective layer, for example Organic polymeric materials for example, fluorination resin, an epoxy resin, silicone resin, and epoxy silicone resin -- Polystyrene, polyester, a polycarbonate, a polyamide, polyimide, Polyamidoimide, poly paraxylene, polyethylene, polyphenylene oxide, an inorganic material (for example, diamond thin film, amorphous silica, and electric insulation glass --) A metallic oxide, a metal nitride, a metal carbonization object, metallic sulfide, and the ingredient that can mention a photo-setting resin etc. further and is used for a protective layer may be used independently, or may be used together. [two or more] A protective layer may be structure much more, and may be multilayer structure.

[0079] Moreover, for example, a metal oxide film (for example, aluminum-oxide film) and the metal fluoride film can also be prepared in an electrode as a protective layer. Moreover, for example, the volume phase (interlayer) which consists of an organic phosphorous compound, polysilane, an aromatic amine derivative, and a phthalocyanine derivative can also be prepared on the surface of an anode plate. Furthermore, an electrode, for example, an anode plate, can also process and use the front face with an acid, ammonia/hydrogen peroxide, or the plasma.

[0080] Generally, the organic electroluminescence devices of this invention can be used also as a component of a pulse drive mold or an alternating current drive mold, although used as a component of a direct-current drive mold. In addition, generally a seal-off approval electrical potential difference is about 2-30V. The organic electroluminescence devices of this invention can be used for for example, the panel mold light source, various kinds of light emitting devices, various kinds of display devices, various kinds of indicators, various kinds of sensors, etc.

[0081]

[Example] Hereafter, although the example of manufacture and an example explain this invention to a detail further, of course, this invention is not limited by these.

Example 1 of manufacture Manufacture benzoof the compound of the instantiation compound A -1 [k] Fluoranthene-3-IRUHOU acidsg [5.92] and 9 and 10-dibromo anthracene 3.36g, 4.24g [of sodium carbonates], and tetrakis (triphenylphosphine) palladium 0.69g was flowed back in toluene (100ml) and water (20ml) for 5 hours. After distilling toluene out of a reaction mixture, the depositing solid-state was separated. This solid-state was processed with the alumina column chromatography (eluate: toluene). After distilling off toluene under reduced pressure, residue was recrystallized from the mixed solvent of toluene and an acetone, and 6.24g of compounds of the instantiation compound A -1 was obtained as a yellow crystal.

元素分析: $C_{54}H_{30}$ として

	C	H
計算値 (%)	95.55	4.45
実測値 (%)	95.84	4.16

Mass analysis: $m/z=678$

In addition, this compound is 500 degrees C and 10-5 Torr the melting point of 250 degrees C or more. It was able to sublime under conditions. The absorption maximum of 425nm (inside of toluene) [0082] It sets for the example 2 of manufacture - the example 1 of 38 manufactures, and is benzo[k]. Instead of using a fluoranthene-3-IRUHO acid, they are various benzo[k]. Except having used the fluoranthene-3-IRUHO acid derivative, various 9 and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative were manufactured according to the approach indicated for the example 1 of manufacture. Benzoused for the 1st table (Table 1 - 5) [k] The instantiation compound number showed a fluoranthene-3-IRUHO acid derivative and 9 manufactured, and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene derivative. Moreover, the absorption maximum in toluene (nm) was shown collectively. In addition, the manufactured compound was the crystal of yellow - yellow orange, and the melting point of those compounds was 250 degrees C or more.

[0083]

[Table 1]

第1表

製造例	ベンゾ[k] フルオランテン-3-イルホウ酸誘導体	例示化合物番号	吸収極大 (nm)
2	12-エチルベンゾ[k] フルオランテン-3-イルホウ酸	A-2	425
3	7,12-ジメチルベンゾ[k] フルオランテン-3-イルホウ酸	A-8	426
4	7,12-ジエチルベンゾ[k] フルオランテン-3-イルホウ酸	A-9	424
5	7,12-ジ-n-プロピルベンゾ[k] フルオランテン-3-イルホウ酸	A-10	426
6	7,12-ジ-n-ブチルベンゾ[k] フルオランテン-3-イルホウ酸	A-12	423
7	7,12-ジ-tert-ブチルベンゾ[k] フルオランテン-3-イルホウ酸	A-13	423
8	7,12-ジシクロヘキシルベンゾ[k] フルオランテン-3-イルホウ酸	A-17	421
9	9,10-ジエチルベンゾ[k] フルオランテン-3-イルホウ酸	A-25	429

[0084]

[Table 2]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン-3 -イルホ ウ酸誘導体	例示化合 物番号	吸収極大 (nm)
1 0	9,10-ジ-n-ヘキシルベンゾ[k] フル オランテン-3 -イルホウ酸	A-2 6	4 2 7
1 1	7,12-ジエチル-9,10-ジ-n-ブチル ベンゾ[k] フルオランテン-3 -イルホ ウ酸	A-2 9	4 2 6
1 2	8,9,10,11 -テトラメチルベンゾ[k]. フ ルオランテン-3 -イルホウ酸	A-3 4	4 2 8
1 3	7,8,9,10,11,12-ヘキサ-n-プロピル ベンゾ[k] フルオランテン-3 -イルホ ウ酸	A-3 5	4 2 6
1 4	10-フルオロベンゾ[k] フルオランテン -3 -イルホウ酸	B-1	4 2 7
1 5	12-フルオロベンゾ[k] フルオランテン -3 -イルホウ酸	B-2	4 2 7
1 6	9,10-ジフルオロベンゾ[k] フルオラン テン-3 -イルホウ酸	B-3	4 2 9

[0085]

[Table 3]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン-3 -イルホ ウ酸誘導体	例示化合 物番号	吸収極大 (nm)
17	7,12-ジ-n-ヘキシル-9,10-ジフル オロベンゾ[k] フルオランテン-3 -イル ホウ酸	B-6	431
18	12-フェニルベンゾ[k] フルオランテン -3 -イルホウ酸	C-1	438
19	7-メチル-12-フェニルベンゾ[k] フ ルオランテン-3 -イルホウ酸	C-2	434
20	7-エチル-12-フェニルベンゾ[k] フ ルオランテン-3 -イルホウ酸	C-4	435
21	7,12-ジフェニルベンゾ[k] フルオラン テン-3-イルホウ酸	C-6	440
22	7,12-ジ (4'-メチルフェニル) ベンゾ [k] フルオランテン-3 -イルホウ酸	C-7	447
23	7,12-ジ (3'-メチルフェニル) ベンゾ [k] フルオランテン-3 -イルホウ酸	C-8	447
24	7,12-ジ (4'-n-ブチルフェニル) ベ ンゾ[k] フルオランテン-3-イルホウ酸	C-13	447

[0086]

[Table 4]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン-3 -イルホ ウ酸誘導体	例示化合 物番号	吸収極大 (nm)
2 5	7,12-ジ (4'-n-ヘキシルフェニル) ベンゾ[k] フルオランテン-3- イルホウ 酸	C-1 6	4 4 7
2 6	7,12-ジ (4'-メトキシフェニル) ベン ゾ[k] フルオランテン-3 -イルホウ酸	C-2 4	4 4 9
2 7	7,12-ジ (4'-イソプロピルオキシフェ ニル) ベンゾ[k] フルオランテン-3- イ ルホウ酸	C-2 7	4 4 8
2 8	7,12-ジ (4'-フルオロフェニル) ベン ゾ[k] フルオランテン-3 -イルホウ酸	C-3 6	4 4 7
2 9	7,12-ジ (1'-ナフチル) ベンゾ[k] フ ルオランテン-3 -イルホウ酸	C-3 8	4 5 2
3 0	7,12-ジフェニル-9,10-ジメチルベン ゾ[k] フルオランテン-3 -イルホウ酸	C-4 0	4 5 8
3 1	8,11-ジフェニルベンゾ[k] フルオラン テン-3 -イルホウ酸	C-4 2	4 5 9

[0087]

[Table 5]

第1表 (続き)

製造例	ベンゾ[k] フルオランテン-3 -イルホウ酸誘導体	例示化合物番号	吸収極大 (nm)
3 2	8,11-ジ (4'-メチルフェニル) ベンゾ [k] フルオランテン-3 -イルホウ酸	C-4 3	4 5 5
3 3	7,12-ジメチル-8,11-ジフェニルベンゾ [k] フルオランテン-3 -イルホウ酸	C-4 6	4 5 7
3 4	7,12-ジエチル-9,10-ジフェニルベンゾ [k] フルオランテン-3 -イルホウ酸	C-4 8	4 5 8
3 5	7,8,11,12 -テトラフェニルベンゾ [k] フルオランテン-3 -イルホウ酸	C-5 1	4 6 2
3 6	7,12-ジ (4'-メチルフェニル) -8,11-ジフェニルベンゾ [k]フルオランテン-3 -イルホウ酸	C-5 2	4 6 4
3 7	7,8,9,10,11,12-ヘキサフェニルベンゾ [k] フルオランテン-3 -イルホウ酸	C-6 0	4 6 8

[0088] The glass substrate which has an ITO transparent electrode (anode plate) with an example 1 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3×10^{-6} Torr about the vacuum evaporatio no tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporatio no equipment. It decompressed. First, it is 4 and 4' screw [-] [N-phenyl-N-(3"-methylphenyl) amino] biphenyl on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the hole-injection transportation layer. Subsequently, a source of vacuum evaporatio no which is different on it in screw (2-methyl-8-quinolate) (4-phenyl phenolate) aluminum, and 9 and 10-screw (benzo[k] fluoranthene-3'-IRU) anthracene (compound of the instantiation compound number A-1) to evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 100:0.5) was carried out to the thickness of 50nm, and it considered as the luminous layer. Next, it is tris (8-quinolate) aluminum Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the electron injection transportation layer. Furthermore on it, they

are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporation was carried out, with the reduced pressure condition of a vacuum evaporation tub maintained. When the direct current voltage of 12V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 54 mA/cm². The current flowed.

Brightness 2420 cd/m² Bluish green luminescence was checked.

[0089] In two to example 41 example 1, instead of using the compound of the instantiation compound A -1 on the occasion of formation of a luminous layer The compound (example 2) of the instantiation compound number A-2, the compound of the instantiation compound number A-8 (example 3), The compound (example 4) of the instantiation compound number A-9, the compound of the instantiation compound number A-10 (example 5), The compound (example 6) of the instantiation compound number A-12, the compound of the instantiation compound number A-13 (example 7), The compound (example 8) of the instantiation compound number A-17, the compound of the instantiation compound number A-25 (example 9), The compound (example 10) of the instantiation compound number A-26, the compound of the instantiation compound number A-29 (example 11), The compound (example 12) of the instantiation compound number A-34, the compound of the instantiation compound number A-35 (example 13), The compound (example 14) of the instantiation compound number B-1, the compound of the instantiation compound number B-2 (example 15), The compound (example 16) of the instantiation compound number B-3, the compound of the instantiation compound number B-6 (example 17), The compound (example 18) of the instantiation compound number C-1, the compound of the instantiation compound number C-2 (example 19), The compound (example 20) of the instantiation compound number C-4, the compound of the instantiation compound number C-6 (example 21), The compound (example 22) of the instantiation compound number C-7, the compound of the instantiation compound number C-8 (example 23), The compound (example 24) of the instantiation compound number C-13, the compound of the instantiation compound number C-16 (example 25), The compound (example 26) of the instantiation compound number C-24, the compound of the instantiation compound number C-27 (example 27), The compound (example 28) of the instantiation compound number C-36, the compound of the instantiation compound number C-38 (example 29), The compound (example 30) of the instantiation compound number C-40, the compound of the instantiation compound number C-42 (example 31), The compound (example 32) of the instantiation compound number C-43, the compound of the instantiation compound number C-46 (example 33), The compound (example 34) of the instantiation compound number C-48, the

compound of the instantiation compound number C-51 (example 35), Organic electroluminescence devices were produced by the approach of a publication in the example 1 except having used the compound (example 36) of the instantiation compound number C-52, and the compound (example 37) of the instantiation compound number C-60. When the direct current voltage of 12V was impressed to each component under the desiccation ambient atmosphere, luminescence of bluish green - yellowish green was checked. Furthermore the property was investigated and the result was shown in the 2nd table (Table 6 - 7).

[0090] On the occasion of formation of a luminous layer, without using the compound of the instantiation compound number A-1, only using screw (2-methyl-8-quinolate) (4-phenyl phenolate) aluminum, it vapor-deposited in thickness of 50nm, and organic electroluminescence devices were produced by the approach of a publication in the example 1 in example of comparison 1 example 1 except having considered as the luminous layer. Blue luminescence was checked when the direct current voltage of 12V was impressed to this component under the desiccation ambient atmosphere. Furthermore the property was investigated and the result was shown in the 2nd table.

[0091] In example of comparison 2 example 1, organic electroluminescence devices were produced by the approach of a publication in the example 1 except having used N-methyl-2-methoxy acridone instead of using the compound of the instantiation compound number A-1 on the occasion of formation of a luminous layer. Blue luminescence was checked when the direct current voltage of 12V was impressed to this component under the desiccation ambient atmosphere. Furthermore the property was investigated and the result was shown in the 2nd table.

[0092]

[Table 6]

第2表

有機電界 発光素子	輝度 (cd/m^2)	電流密度 (mA/cm^2)
実施例2	2 3 2 0	5 3
実施例3	2 3 4 0	5 6
実施例4	2 4 3 0	5 3
実施例5	2 3 4 0	5 6
実施例6	2 3 5 0	5 5
実施例7	2 4 2 0	5 5
実施例8	2 4 0 0	5 4
実施例9	2 3 9 0	5 5
実施例10	2 4 4 0	5 6
実施例11	2 3 8 0	5 4
実施例12	2 3 5 0	5 5
実施例13	2 4 1 0	5 2
実施例14	2 4 6 0	5 3
実施例15	2 4 3 0	5 6
実施例16	2 4 1 0	5 4
実施例17	2 4 0 0	5 5
実施例18	2 5 2 0	5 5
実施例19	2 4 8 0	5 3
実施例20	2 4 5 0	5 5
実施例21	2 4 6 0	5 6
実施例22	2 4 4 0	5 5
実施例23	2 3 5 0	5 3
実施例24	2 4 3 0	5 4

[0093]

[Table 7]

第2表 (続き)

有機電界 発光素子	輝度 (cd/m^2)	電流密度 (mA/cm^2)
実施例25	2330	56
実施例26	2410	53
実施例27	2420	55
実施例28	2380	56
実施例29	2330	52
実施例30	2350	54
実施例31	2350	55
実施例32	2400	53
実施例33	2360	53
実施例34	2380	54
実施例35	2430	55
実施例36	2390	54
実施例37	2370	53
比較例1	1170	82
比較例2	1550	74

[0094] The glass substrate which has an ITO transparent electrode (anode plate) with an example 38 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3×10^{-6} Torr about the vacuum evaporationno tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporationno equipment. It decompressed. First, it is 4 and 4' screw [-] [N-phenyl-N-(3"-methylphenyl) amino] biphenyl on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the hole-injection transportation layer. Subsequently, a source of vacuum evaporationno which is different on it in the compound of screw (2-methyl-8-quinolate) (4-phenyl phenolate) aluminum and the instantiation compound number A-2 to evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 100:1.0) was carried out to the thickness of 50nm, and it considered as the luminous layer. Next, it is tris (8-quinolate) aluminum Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as

cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporation was carried out, with the reduced pressure condition of a vacuum evaporation tub maintained. When the direct current voltage of 12V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 53 mA/cm². The current flowed.

Brightness 2320 cd/m² Bluish green luminescence was checked.

[0095] The glass substrate which has an ITO transparent electrode (anode plate) with an example 39 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3x10⁻⁶ Torr about the vacuum evaporation tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporation equipment. It decompressed. First, it is 4 and 4' screw [-] [N-phenyl-N-(3"-methylphenyl) amino] biphenyl on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the hole-injection transportation layer. Subsequently, a source of vacuum evaporation which is different on it in the compound of screw (2-methyl-8-quinolate) aluminum-mu-oxo--screw (2-methyl-8-quinolate) aluminum and the instantiation compound number A-8 to evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 100:2.0) was carried out to the thickness of 50nm, and it considered as the luminous layer. Next, it is tris (8-quinolate) aluminum Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporation was carried out, with the reduced pressure condition of a vacuum evaporation tub maintained. When the direct current voltage of 12V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 53 mA/cm². The current flowed. Brightness 2420 cd/m² Bluish green luminescence was checked.

[0096] The glass substrate which has an ITO transparent electrode (anode plate) with an example 40 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3x10⁻⁶ Torr about the vacuum evaporation tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporation equipment. It decompressed. First, it is 4 and 4' screw [-] [N-phenyl-N-(3"-methylphenyl) amino] biphenyl on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the hole-injection transportation layer. Subsequently, a source of vacuum evaporation which is different on it in the compound of screw (2, 4-dimethyl-8-quinolate) aluminum-mu-oxo--screw (2, 4-dimethyl-8-quinolate) aluminum and the instantiation compound number A-9

to evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 100:4.0) was carried out to the thickness of 50nm, and it considered as the luminous layer. Next, it is tris (8-quinolate) aluminum Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporation was carried out, with the reduced pressure condition of a vacuum evaporation tub maintained. When the direct current voltage of 12V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 52 mA/cm². The current flowed. Brightness 2380 cd/m² Bluish green luminescence was checked.

[0097] The glass substrate which has an ITO transparent electrode (anode plate) with an example 41 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3×10^{-6} Torr about the vacuum evaporation tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporation equipment. It decompressed. First, it is 4 and 4' screw [-]

[N-phenyl-N-(3"-methylphenyl) amino] biphenyl on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the hole-injection transportation layer. Subsequently, a source of vacuum evaporation which is different on it in the compound of tris (8-quinolate) aluminum and the instantiation compound number A-10 to evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 100:6.0) was carried out to the thickness of 50nm, and it considered as the luminous layer. Next, it is tris (8-quinolate) aluminum Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporation was carried out, with the reduced pressure condition of a vacuum evaporation tub maintained. When the direct current voltage of 12V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 53 mA/cm². The current flowed. Brightness 2320 cd/m² Bluish green luminescence was checked.

[0098] The glass substrate which has an ITO transparent electrode (anode plate) with an example 42 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3×10^{-6} Torr about the vacuum evaporation tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporation equipment. It decompressed. First, it is 4 and 4' screw [-]

[N-phenyl-N-(3"-methylphenyl) amino] biphenyl on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the hole-injection transportation layer. Subsequently, a source of vacuum evaporation which is different on it in the compound of tris (8-quinolate) aluminum and the instantiation compound number C-40 to evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 100:10) was carried out to the thickness of 50nm, and it considered as the luminous layer. Next, it is tris (8-quinolate) aluminum Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporation was carried out, with the reduced pressure condition of a vacuum evaporation tub maintained. When the direct current voltage of 12V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 59 mA/cm². The current flowed. Brightness 2400 cd/m² Bluish green luminescence was checked.

[0099] The glass substrate which has an ITO transparent electrode (anode plate) with an example 43 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3x10⁻⁶ Torr about the vacuum evaporation tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporation equipment. It decompressed. First, it is 4 and 4' screw [-]

[N-phenyl-N-(3"-methylphenyl) amino] biphenyl on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the hole-injection transportation layer. Subsequently, a source of vacuum evaporation which is different on it in the compound of tris (8-quinolate) aluminum and the instantiation compound number C-48 to evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 100:1.0) was carried out to the thickness of 50nm, and it considered as the luminous layer which served as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporation was carried out, with the reduced pressure condition of a vacuum evaporation tub maintained. When the direct current voltage of 12V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 57 mA/cm². The current flowed. Brightness 2220 cd/m² Bluish green luminescence was checked.

[0100] The glass substrate which has an ITO transparent electrode (anode plate) with an example 44 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3x10⁻⁶ Torr about the vacuum

evaporationno tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporationno equipment. It decompressed. First, it is 4 and 4' screw [-] [N-phenyl-N-(3"-methylphenyl) amino] biphenyl on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the hole-injection transportation layer. Subsequently, it is the compound of the instantiation compound number C-48 on it Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the luminous layer. subsequently, a it top -- 1 and 3-screw [5'-(p-tert-buthylphenyl)- 1, 3, and 4-OKISA diazole-2' - IRU] benzene -- evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporationno was carried out, with the reduced pressure condition of a vacuum evaporationno tub maintained. When the direct current voltage of 14V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 44 mA/cm². The current flowed. Brightness 1960 cd/m² Bluish green luminescence was checked.

[0101] The glass substrate which has an ITO transparent electrode (anode plate) with an example 45 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3x10⁻⁶ Torr about the vacuum evaporationno tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporationno equipment. It decompressed. First, it is the compound of the instantiation compound number A-25 on an ITO transparent electrode Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 55nm, and considered as the luminous layer. subsequently, a it top -- 1 and 3-screw [5'-(p-tert-buthylphenyl)- 1, 3, and 4-OKISA diazole-2' - IRU] benzene -- evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 75nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporationno was carried out, with the reduced pressure condition of a vacuum evaporationno tub maintained. When the direct current voltage of 14V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 57 mA/cm². The current flowed. Brightness 1430 cd/m² Bluish green luminescence was checked.

[0102] The glass substrate which has an ITO transparent electrode (anode plate) with an example 46 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. It is 3x10⁻⁶ Torr about the vacuum

evaporationno tub after drying the substrate using nitrogen gas, carrying out UV / ozone washing further and fixing to the substrate electrode holder of vacuum evaporationno equipment. It decompressed. First, on the ITO transparent electrode, by evaporation rate 0.1 nm/sec, 4, 4', and a 4"-tris [N-(3"-methylphenyl)-N-phenylamino] triphenylamine were vapor-deposited in thickness of 50nm, and were used as the first hole-injection transportation layer. Subsequently, 4, 4', and a source of vacuum evaporationno that is different in the compound of - screw [N-phenyl-N-(1"-naphthyl) amino] biphenyl and the instantiation compound number A-1 to evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 100:5) was carried out to the thickness of 20nm, and it considered as the luminous layer which served as the second hole-injection transportation layer. Subsequently, it is tris (8-quinolate) aluminum on it Evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 50nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. In addition, vacuum evaporationno was carried out, with the reduced pressure condition of a vacuum evaporationno tub maintained. When the direct current voltage of 15V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 60 mA/cm². The current flowed.

Brightness 2660 cd/m² Bluish green luminescence was checked.

[0103] In 47 to example 59 example 46, instead of using the compound of the instantiation compound number A-1 The compound (example 47) of the instantiation compound number A-2, the compound of the instantiation compound number A-8 (example 48), The compound (example 49) of the instantiation compound number A-12, the compound of the instantiation compound number A-17 (example 50), The compound (example 51) of the instantiation compound number A-29, the compound of the instantiation compound number A-34 (example 52), The compound (example 53) of the instantiation compound number B-3, the compound of the instantiation compound number B-6 (example 54), The compound (example 55) of the instantiation compound number C-8, the compound of the instantiation compound number C-27 (example 56), Organic electroluminescence devices were produced by the approach of a publication in the example 46 except having used the compound (example 57) of the instantiation compound number C-38, the compound (example 58) of the instantiation compound number C-42, and the compound (example 59) of the instantiation compound number C-52. When the direct current voltage of 12V was impressed to each component under the desiccation ambient atmosphere, bluish green luminescence was checked. Furthermore the property was investigated and the result was shown in the 3rd table (Table 8).

[0104]

[Table 8]
第3表

有機電界 発光素子	輝度 (cd/m ²)	電流密度 (mA/cm ²)
実施例47	2560	54
実施例48	2490	57
実施例49	2510	58
実施例50	2670	56
実施例51	2630	54
実施例52	2700	54
実施例53	2480	56
実施例54	2680	55
実施例55	2700	54
実施例56	2630	56
実施例57	2440	57
実施例58	2740	54
実施例59	2580	55

[0105] The glass substrate which has an ITO transparent electrode (anode plate) with an example 60 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. The substrate was dried using nitrogen gas and UV / ozone washing was carried out further. On an ITO transparent electrode, next, Poly N-vinylcarbazole (weight average molecular weight 150000), 1, 1, 4, 4, - tetra-phenyl-1,3-butadiene (blue luminescence component), A coumarin 6 "a [3-(2'-benzothiazolyl)-7-diethylamino coumarin]" (green luminescence component), And the 400nm luminous layer was formed with the dip coating method using 3% of the weight of the dichloroethane solution which contains the compound of the instantiation compound number A-10 at a rate of the weight ratio 100:5:3:2, respectively. Next, it is 3x10⁻⁶ Torr about the vacuum evaporatio no tub after fixing to the substrate electrode holder of vacuum evaporatio no equipment the glass substrate which has this luminous layer. It decompressed. furthermore, a luminous layer top -- 3-(4'-tert-buthylphenyl)-4-phenyl-5-(4"-biphenyl)- 1, 2, and 4-triazole -- evaporation rate 0.2 nm/sec after vapor-depositing in thickness of 20nm -- further -- a it top -- tris (8-quinolate) aluminum -- evaporation rate 0.2 nm/sec It vapor-deposited in thickness of 30nm, and considered as the electron injection transportation layer. Furthermore on it, they are magnesium and silver Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic

electroluminescence devices were produced. When the direct current voltage of 12V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 64 mA/cm². The current flowed. Brightness 1320 cd/m² White luminescence was checked.

[0106] In 61 to example 70 example 60, instead of using the compound of the instantiation compound number A-10 The compound (example 61) of the instantiation compound number A-13, the compound of the instantiation compound number A-34 (example 62), The compound (example 63) of the instantiation compound number C-4, the compound of the instantiation compound number C-16 (example 64), Organic electroluminescence devices were produced by the approach of a publication in the example 60 except having used the compound (example 65) of the instantiation compound number C-27, and the compound (example 66) of the instantiation compound number C-48. White luminescence was observed when the direct current voltage of 12V was impressed to each component under the desiccation ambient atmosphere. Furthermore the property was investigated and the result was shown in the 4th table (Table 9).

[0107]

[Table 9]

第4表

有機電界 発光素子	輝度 (cd/m ²)	電流密度 (mA/cm ²)
実施例 6 1	1 2 6 0	7 7
実施例 6 2	1 2 4 0	7 6
実施例 6 3	1 2 5 0	7 5
実施例 6 4	1 2 5 0	7 4
実施例 6 5	1 2 4 0	7 5
実施例 6 6	1 2 7 0	7 3

[0108] The glass substrate which has an ITO transparent electrode (anode plate) with an example 67 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. The substrate was dried using nitrogen gas and UV / ozone washing was carried out further. next, an ITO transparent electrode top -- Polly N-vinylcarbazole (weight average molecular weight 150000), 1, and 3-screw [5'-(p-tert-buthylphenyl)- 1, 3, and 4-OKISA diazole-2' -- the 300nm luminous layer was formed with the dip coating method using 3% of the weight of the dichloroethane solution which the weight ratio 100:30:3 comes out comparatively, respectively, and contains the compound of - IRU] benzene and the instantiation compound number A-2. Next, it is 3x10⁻⁶ Torr about the vacuum evaporatio no tub after fixing to the substrate electrode

holder of vacuum evaporation equipment the glass substrate which has this luminous layer. It decompressed. Furthermore, they are magnesium and silver on a luminous layer. Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. When the direct current voltage of 15V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 71 mA/cm². The current flowed. Brightness 1320 cd/m² Bluish green luminescence was checked.

[0109] In example of comparison 3 example 67, organic electroluminescence devices were produced by the approach of a publication in the example 67 instead of the compound of the instantiation compound number A-2 on the occasion of formation of a luminous layer except having used 1, 1, 4, and 4-tetra-phenyl-1,3-butadiene. When the direct current voltage of 15V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 86 mA/cm². The current flowed. Brightness 750 cd/m² Blue luminescence was checked.

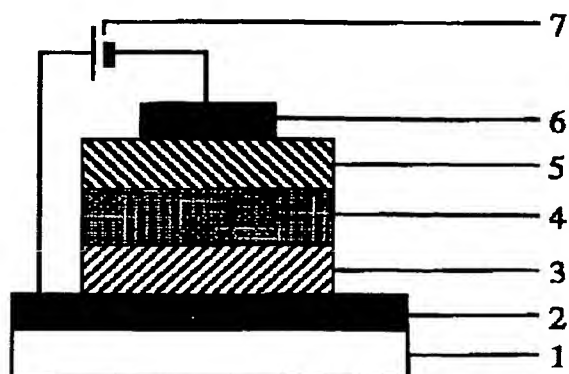
[0110] The glass substrate which has an ITO transparent electrode (anode plate) with an example 68 thickness of 200nm was cleaned ultrasonically using neutral detergent, an acetone, and ethanol. The substrate was dried using nitrogen gas and UV / ozone washing was carried out further. On an ITO transparent electrode, next, a polycarbonate (weight average molecular weight 50000), 4 and 4' screw [-] [N-phenyl-N-(3"-methylphenyl) amino] biphenyl, The compound of screw (2-methyl-8-quinolate) aluminum-mu-oxo--screw (2-methyl-8-quinolate) aluminum and the instantiation compound number C-8 The 300nm luminous layer was formed with the dip coating method using 3% of the weight of the dichloroethane solution contained at a rate of the weight ratio 100:40:60:1, respectively. Next, it is 3x10⁻⁶ Torr about the vacuum evaporation tub after fixing to the substrate electrode holder of vacuum evaporation equipment the glass substrate which has this luminous layer. It decompressed. Furthermore, they are magnesium and silver on a luminous layer. Evaporation rate 0.2 nm/sec Vapor codeposition (weight ratio 10:1) was carried out to the thickness of 200nm, it considered as cathode, and organic electroluminescence devices were produced. When the direct current voltage of 15V was impressed to the produced organic electroluminescence devices under the desiccation ambient atmosphere, it is 63 mA/cm². The current flowed. Brightness 890 cd/m² Bluish green luminescence was checked.

[0111]

[Effect of the Invention] It became possible to offer organic electroluminescence devices excellent in luminescence brightness by this invention. Furthermore, it became possible to offer the hydrocarbon compound suitable for this light emitting device.

[Translation done.]

Drawing selection drawing 1 ▼



[Translation done.]

BEST AVAILABLE COPY

Copyright (C); 2000 Japan Patent Office

THIS PAGE BLANK (USPTO)